

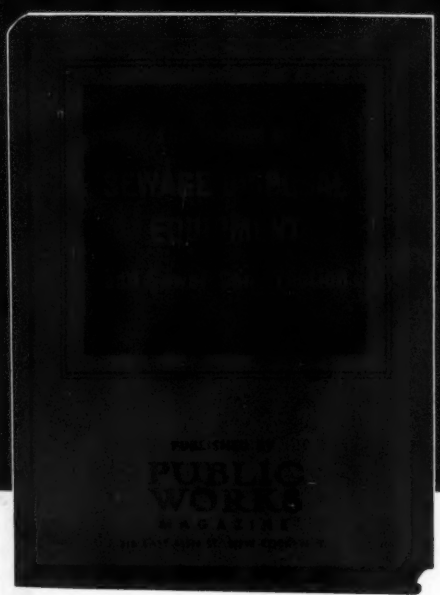
1945

1945
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a Sewage Plant
How Provo Trades River
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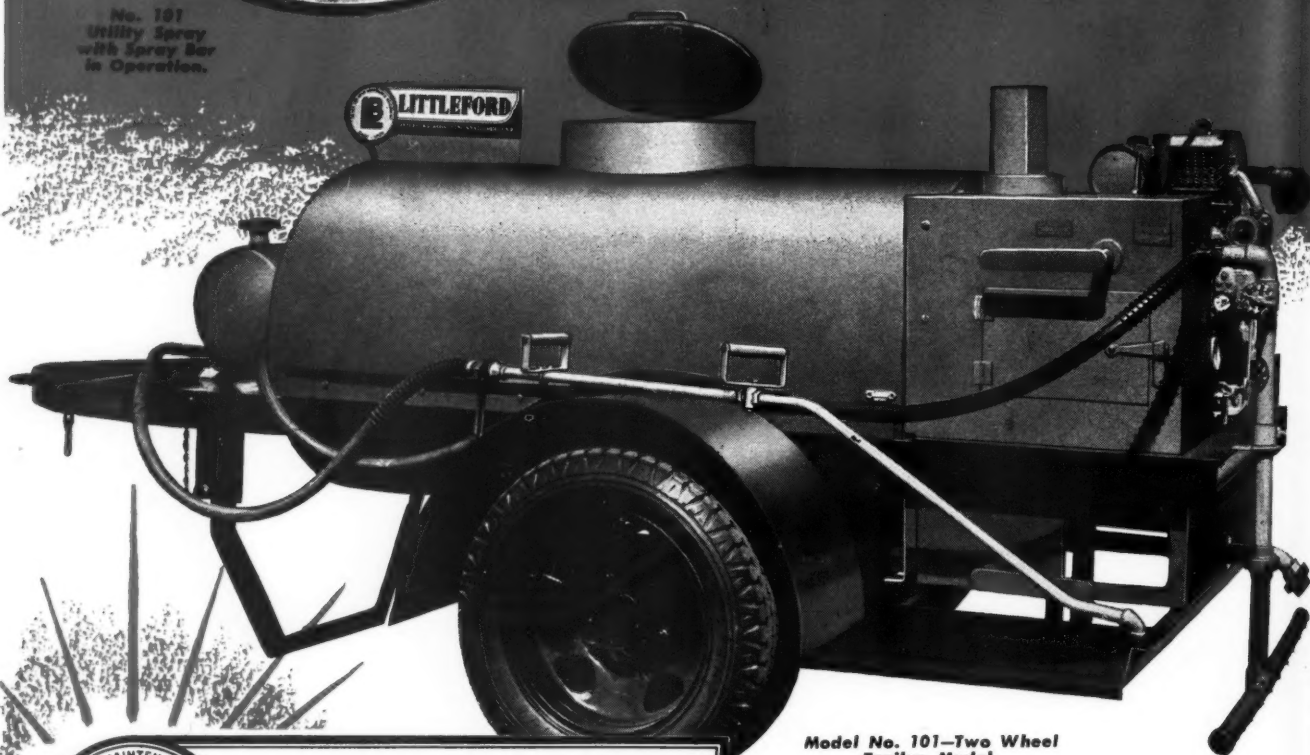
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310 E. 45th St., New York 17, N. Y.

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Vol. 76 No. 2

A. PRESCOTT FOLWELL, Editor

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Published monthly by PUBLIC WORKS JOURNAL CORPORATION

Editorial and advertising offices: 310 East 45th St., New York 17, N. Y.

J. T. MORRIS, *President*; CROXTON MORRIS, *Treasurer*; A. PRESCOTT FOLWELL, *Secretary*. Advertising representatives: New York: ARTHUR K. AKERS, *Advertising Manager*; Chicago: LEWIS C. MORRIS, 612 No. Michigan Ave., Chicago 11, Ill.; Cleveland: ALONZO HAWLEY, 326 Bulkley Building, Cleveland 15, Ohio. SUBSCRIPTION RATES: U.S.A. and Possessions, Mexico and Cuba, \$3.00; Canada, \$3.50. All other countries, \$4.00. Single Copies, 35 cents each except issues containing book-length texts, which are \$1.00 apiece.



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WAR and POSTWAR EMERGENCIES



Planning for Returning Veterans

The civil service commission of Seattle, Washington, is making plans for the reinstatement of city employees returning from military service; 160 out of eight hundred city employees in the military service have already been discharged and returned to the city pay roll or have decided not to return to the municipal service. . . . The civil service commission in Detroit, Michigan, will give city employees in military service additional leaves of absence equal in duration to educational benefits given war veterans by the federal government. It is estimated that about 60 per cent of some 2,500 city employees on military leave were under 25 years of age when they entered the service and thus will be eligible for federal educational benefits.

Planning for Postwar Public Works

In Maine, 218 municipalities report that they have over three million dollars of postwar projects ready to start with 30 days' notice; while 296 municipalities report about eleven million dollars' worth in various plan stages. The projects include roads and bridges, water supplies, sewers and treatment plants, parks, schools and other public buildings.

Miami, Fla., has nearly completed a four million dollar program for postwar sidewalk construction, the entire program to be contracted as a single job and the cost to be prorated among property owners. The city expects to place on sale early this year revenue bonds for construction of a sewerage system providing for a population of 710,000 people and one unit of a treatment plant designed for 450,000.

Commissioner Thomas H. MacDonald, of the Public Roads Administration, has said that the PRA is ready to receive proposed projects submitted by the state highway departments for approval and the eventual expenditure of their share of the \$500,000,000 appropriated by Congress for making surveys and plans and acquiring rights-of-way for postwar construction.

The New Bureau of Community Facilities

The Federal Works Agency has established a Bureau of Community Facilities for the specific purpose of carrying out work authorized under the Lanham Act and distributing such federal funds as Congress provides for local planning groups. It replaces the War Public Services and the War Public Works division.

Conventions Cancelled

In response to the expressed policy of the U. S. Government concerning annual meetings, the Executive Committee of The United States Conference of Mayors cancelled the Annual Conference scheduled for January 25-27 in Washington, D. C.

Also the directors of the New Jersey Sewage Works Association have called off the annual convention of

that association, which was scheduled for March 22nd and 23rd.

Also the American Water Works Association has "indefinitely postponed" its convention scheduled for May 7th.

The American Society of Civil Engineers has cancelled the annual summer convention and the spring and fall regional meetings.

Other cancellations of meetings include those of the Association of Highway Officials of the North Atlantic States; the Southeastern Association of State Highway Officials, and the University of Illinois Annual Highway Conference.

Probable Legislative Actions

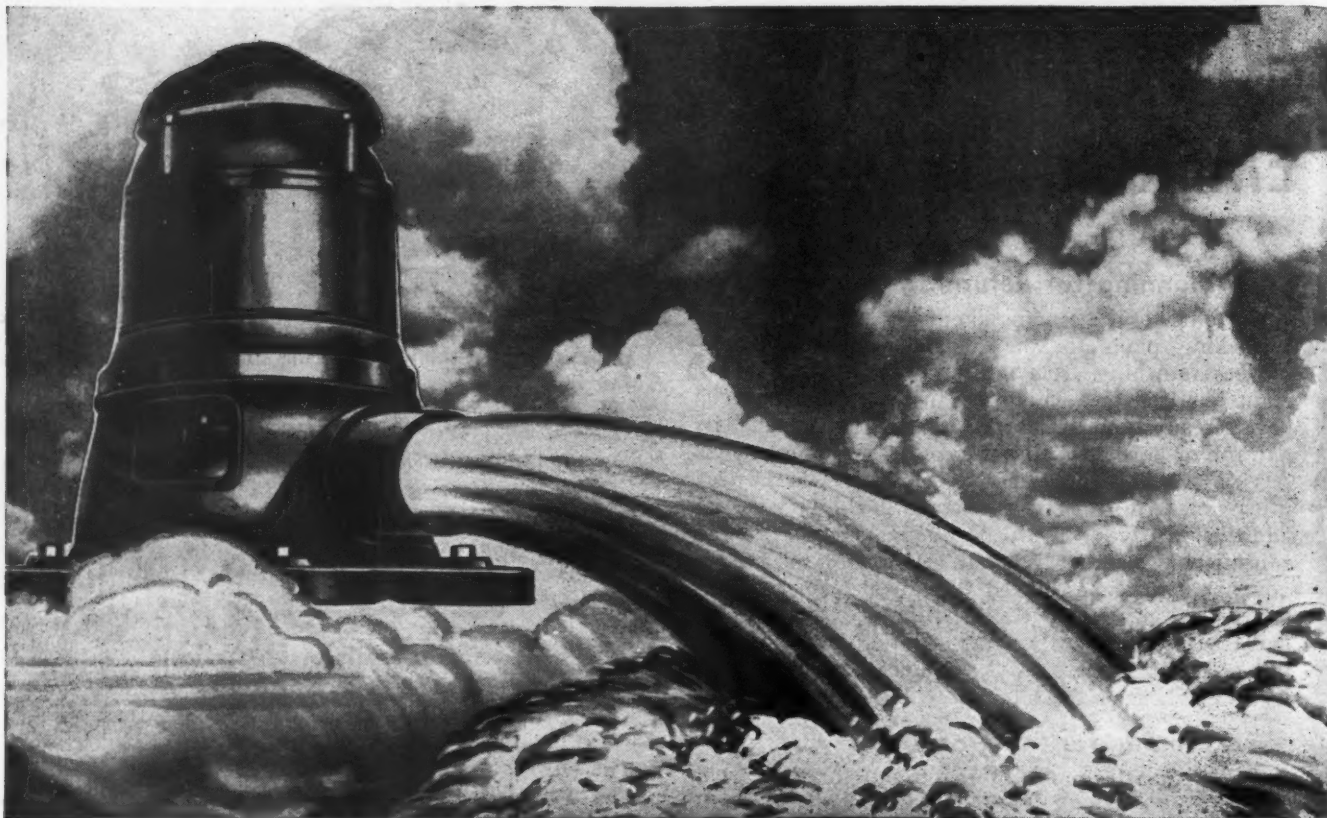
All state legislatures have regular sessions this year except those of Kentucky, Louisiana, Mississippi and Virginia. Threats of increases in gasoline tax rates are reported from 19 states, and of increases of other motor vehicle taxes from 15 states. Legal authority for broader motor vehicle reciprocity agreements is expected to be sought in 17 states. Efforts to gain more liberal motor vehicle sizes and weights legislation or to make permanent the temporary wartime remedial measures are reported from 24 states.

Anti-diversion constitutional amendments or statutes are expected by Alabama, Arkansas, Connecticut, Georgia, Illinois, Indiana, Maryland, Massachusetts, Nebraska, New Mexico, New York, Ohio, Oklahoma, Pennsylvania, Rhode Island, Tennessee, Texas, Utah, Wisconsin and Wyoming. However, there is considerable opposition in several of these states to placing such statutes in the constitution. Diversion is expected to be a major issue in Arkansas, Delaware, Illinois, New Jersey, New York, Ohio, Oklahoma and Rhode Island.

Motor Vehicle Registrations in 1944 and 1945

Motor vehicle registrations during 1944 were approximately 29,846,000, a decrease of 4,626,000 from 1941, according to estimates of the Public Roads Administration. Pointing out that "It is impossible to predict with assurance the number of vehicles which will be registered in 1945," PRA hazarded a guess that 24,500,000 will be registered this year if no new cars are available. Apparently the public has found it necessary to keep motor vehicles in operation, although many of them would have been scrapped in normal times.

The decrease between 1943 and 1944 was 654,000, of which only 11,000 were trucks. PRA accounts for the slight decrease in trucks registered by the fact that 250,000 have been released for civilian use since March 1942; rationing and other war-time restrictions have been more lenient toward trucks, and since continued operation of trucks is absolutely essential, many operators spend abnormal amounts for maintenance of vehicles that normally would have been retired from service.



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VOL. 76. NO. 2



Provo business district, looking northwest from County Courthouse.

How Provo Traded River Water for Spring Water

By ninety years of acquiring and trading water rights, the city has acquired an abundance of mountain spring water. To bring this to the city uncontaminated, a reservoir, pipe lines and tunnels are being built.

By GUY R. McKAY

Assistant City Engineer

UTAH is an arid State. In winter the snows pile up deeply in the higher altitudes, and rain falls occasionally in summer, although the 1944 drought lasted for 96 days without a break; but there would be slim fodder and few inhabitants in Utah if the crops had to depend upon rain-fall.

Water has been well called the life blood of Utah, and its conservation and use have been given careful study. Not infrequently it has been a source of controversy, and many a good lawyer has made a fat living out of the acrimonious disputes which have developed over its use and ownership. You can rob a man's hen roost in Utah, or shoot his dog, or steal his wife, and probably get away with it; but beware of his wrath if you interfere with his water turn.

After nearly a century of use and misuse of water, there has evolved in Utah a body of customs, laws and legal decisions which work satisfactorily, but which are somewhat confusing and mystifying to newcomers to the State.

It has been decreed that all water in the State of Utah, either surface or underground, is the property of the public, and is not owned individually, regardless of the length of time that the water may have been used by the individual. The right to use water cannot be acquired by adverse possession nor by diversion of the water and putting it to beneficial use outside of the statutory procedure.

On the other hand, if a water right has been legally acquired, a man is protected in his right so long as the water is used beneficially, and he can sell, trade or transfer his right like real estate. Ordinarily, if a piece of land is sold the water right is transferred with it, since otherwise the land would be worthless for agricultural purposes. But a water right may be sold separately from the land, and the water returned to its natural course and withdrawn for use, less seepage and evaporation, many miles from its original point of diversion.

Since 1903 the law has required that an applicant



Guy R.
McKay

for a water right must file an application with the State Engineer, who has the authority to approve or reject the application, and no rights to unappropriated water may be acquired without such a filing and compliance with the statutes. You can't legally dig a well in your own back yard without the approval of the State Engineer.

There is still much unappropriated water in Utah which, for various reasons such as inaccessibility, cannot be put to beneficial use without the expenditure of enormous sums of money for dams and reservoirs, canals and irrigation works, far beyond the means of individuals or irrigation companies. In some cases under these conditions the Federal government, through the Bureau of Reclamation, has advanced the money for the construction of important and worthy projects.

Such a project is the Deer Creek dam and reservoir, recently completed, about fifteen miles east of Provo City. This large earth dam has been thrown across Provo canyon so as to impound the waters of the Provo river, the largest and most important stream in this vicinity. The capacity of the reservoir is approximately 150,000 acre-feet.

All of the waters of the Provo river system have long been appropriated, and therefore the normal flow of the river must be maintained through the spillway of the dam during the irrigation season.

The Deer Creek project includes a long tunnel and canals, not yet completed, which propose to bring in new unappropriated water from the Colorado river drainage system. The rights to use this new water have been sold to Salt Lake City, Provo City, and various other communities, individuals and corporations. Provo has acquired 8,000 acre-feet of this storage water.

Provo is beautifully located about 45 miles south of Salt Lake City in a natural amphitheater backed by the rugged Wasatch mountains, which rise to a height of 7,500 feet above the city, and fronting on Utah lake, a body of fresh water thirty miles long and ten miles wide which has its outlet through the Jordan river into Great Salt Lake.

Until a couple of years ago Provo was a pleasant university city, the center of a famous fruit growing area, with a population of about seventeen thousand. Then came the war, and the construction of the \$200,000,000 Geneva steel plant six miles northwest of town, and the population jumped nearly fifty percent to nearly 25,000.

This sudden increase in population has brought to the front municipal problems of water supply, housing and sewage disposal which demanded immediate attention. The housing was supplied by sub-dividers working through the Federal Housing Administration. The city had been pretty well supplied with sewers through

W.P.A. projects, and while some of these are overloaded and will have to be replaced by larger pipe, the city is getting by until manpower is available after the war.

The water problem had also been attacked. A comprehensive improvement of the culinary water supply system had been planned, and a considerable amount of work had been done under W.P.A. projects, but the work had not progressed far enough to furnish the city with the needed additional water. Consequently, many times this summer the storage capacity of the city reservoir has been drained down to a point which was keeping the water superintendent awake nights. Hence the water problem had to be given first attention.

Since 1853, when it was first settled, Provo has been acquiring water rights from the Provo river system for culinary, irrigation and industrial uses. Some of this water came from the natural flow of the river, some from springs, and some was impounded. Only spring water was used for culinary purposes, the remainder being for irrigation within the city limits and for power. By judicious trading of irrigation water for spring water over the years the city has obtained a generous supply of pure mountain spring water. The problem was to keep the water pure and to get it into the city mains.

The present supply system consists of a five-million-gallon circular concrete reservoir, located a half mile north of the city limits; a 27-inch gravity concrete conduit 18,000 feet long to a point near the mouth of Provo canyon; and two pipe lines, one an old 20-inch wood stave line which had been encased in concrete, and the other a recently completed 36-inch concrete pipe line, more or less parallel to the 20-inch line, extending approximately 14,500 feet to a weir house and chlorinating equipment in Provo canyon.

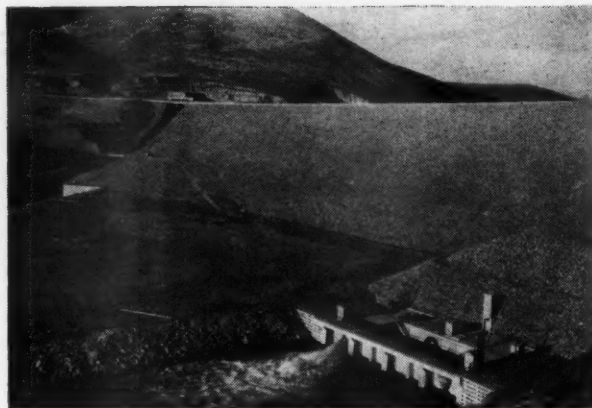
Above the weir house there are tiled collection galleries in a large spring area in the bottom of the canyon. Also there is a 24-inch concrete pipe line extending approximately six miles up the canyon and into the South Fork of the Provo river. There remains about a half-mile of 24-inch line to be laid to connect the system with three large springs of excellent water in South Fork canyon. When this work is done (and it will be done as soon as manpower is available) the city will have an abundance of pure spring water



In Provo canyon, where 36" pipe line was laid. Railroad is concealed by trees.



Deer Creek dam. Crest length, 1300 ft. Height above stream, 155 ft.; above foundation, 235 ft. A 35 ft. highway crosses top of dam.



Downstream face of dam. Outlet works on right side of picture, spillway on left side.

which will be conveyed through pipe lines and protected from contamination from the time it rises to the surface of the ground until it is drawn from the city taps.

Provo had been growing in population rather consistently for many years prior to the war boom. Its future growth depends to a considerable extent upon the peace-time activity of the new \$200,000,000 steel plant. This plant, the newest and most up-to-date in the country, at present is the property of the Defense Plant Corporation, a government agency, and is being operated on a non-profit basis by the Geneva Steel Company, a subsidiary of the U. S. Steel Corporation. At present it is supplying steel plate and structural forms for west coast ship yards.

The future of the steel plant after the war is over seems rather precarious, and depends upon peace-time markets for steel, upon the future ownership of the plant, upon freight rates to the Pacific coast, and to some extent upon politics. These imponderables make predictions unreliable, but Provo is going ahead with plans on the presumption that the plant will operate, and that its operation will invite associated industries into this area. Provo does not propose to be caught napping, and is preparing for a water system which will take care of any conceivable needs.

The consumption of water in this arid region is necessarily high. The daily per capita consumption ranges from a low of 175 gallons in the winter to a maximum of well over 400 gallons in July and August. This means that during the hot, dry summer months the city is using more than twice the capacity of the present reservoir per day, and that to keep the reservoir full the collecting system must be capable of delivering a minimum of fifteen cubic feet of water per second for the present population. The maximum capacity of the collection system as now operating is less than 14 second-feet. Consequently, the draft for lawn sprinkling and household use during the summer months is greater than the delivery to the reservoir.

Now that the 36-inch line is completed, the bottle neck will be in the 27-inch gravity conduit from the reservoir to the mouth of the canyon. A supplemental pipe line must be installed over this 18,000 feet as soon as possible. Surveys are now being made to choose the most suitable location and secure rights of way. Costs and pipe sizes will be calculated from these surveys. Also, a new 10,000,000-gallon reservoir is to be constructed and connected with the present 5,000,000-gallon tank.

During 1944 work on the water system has been confined to the laying of the final 1900 feet of 36-inch line to the weir house. This 14,500 foot pipe line was an ambitious project which was started in 1939 with W.P.A. labor. Thirty five hundred feet of tunnels were driven through solid limestone, with the tunnels large enough to give access to the pipe line for inspection and repairs. Reinforced concrete pressure pipe in eight foot lengths with copper joints was manufactured in Provo by W.P.A. labor and hauled up the canyon in trucks. Trenches were excavated to an average depth of about eight feet. All equipment was furnished by the city, and included portable compressors and rock drills, pumps, concrete mixers, and tools of all kinds.

After the closing of W.P.A. projects, work was suspended on the pipe line until about a year ago, when the Young and Smith Construction Company of Salt Lake City was awarded a contract to complete the line. Nineteen hundred and ten feet of pipe were laid under this contract.

The work done in 1944 was especially interesting because of the difficulties due to the necessity of locating the line in the bottom of the canyon in order to connect with the weir house. The canyon is narrow, and the bottom is congested with a railroad, a paved State highway, the Provo river and several pipe lines. Rocky cliffs rise a thousand feet or more above the floor of the canyon. The floor itself is composed of gravel and river boulders, and is saturated with the sub-surface flow of the river. It was necessary to cross the highway twice with the pipe line, and to lay the pipe in trenches which had to be excavated several feet below the level of the water in the river. The pumping problem was a tough one.

Where the pipe crossed or was laid in the bed of the river it was encased in reinforced concrete for added protection. Some 230 cubic yards of concrete were poured in this operation.

The pipe which was available for finishing the job was not the best that had been manufactured, and a good many of the lengths which had to be used had been culled out and discarded in former operations because of cracked or broken joints or other defects. It was necessary to repair 61 of the joints after the pipe had been laid by pouring concrete collars eighteen inches wide by five inches deep completely around the pipe. Three field joints 40" x 6" were poured also.

(Continued on page 28)



Boeing B-29 Superfortress taking off from one of the 150' x 750' runways.

Enlargement V

By GEO. W. ROSEBERRY

Chief Engineer, Board of Park Commissioners,
Wichita, Kansas

IN order to describe properly the enlargement and improvement work at the Wichita Municipal Airport which was made necessary by the tremendous increase in aviation activity due to the war and by the production of a vast number of military aircraft in Wichita's four aircraft factories—Beech, Boeing, Cessna, and Culver—and more particularly to meet the demands for the flight testing of the great new Boeing B-29 fortress, it is necessary to go back a number of years and describe briefly the history and background of the Airport.



Geo. W. Roseberry.

In 1927 the Wichita Board of Park Commissioners purchased a section (640) acres of all native prairie sod, known as the California Section; one of the last full sections of virgin prairie sod remaining in Sedgwick County. A hangar and later an administration building were built and the field became well-known to many of the great names associated with flying, being near the center of the United States; and, being a field of large area, it was used as the fueling point by most of the speed pilots in nearly all of the early trans-continental races.

Except for small concrete aprons around the building area, little improvement was made on the landing field until late in the fall of 1938, when a program for field improvement was started. This provided for the construction of three reinforced concrete paved runways 4500 feet long, two of them 150 feet wide and one 100 feet wide; grading to bring the landing strips to a maximum longitudinal grade of 0.85% and a maximum transverse grade of .5%; and the construction of a storm-water sewer system of reinforced concrete pipe and reinforced concrete box construction.

In general, the design of this field improvement was as follows:

Reinforced concrete runways of 8½"-6"-8½" section, reinforced with 53-lb. mesh and all expansion and contraction joints doweled; this pavement being laid on a sub-grade uniformly compacted to 90% of maximum density. Runway pavement had a 5% transverse grade with inlets placed along the lower side of pavement to pick up storm water. These inlets, varying in length from 24 feet to 48 feet, and one foot in width, were spaced approximately 200 ft. to 400 ft. apart, depending on the longitudinal gradient, the length of inlet being figured from the following formula:

Cross slope of pavement is .005 foot per foot and, since the velocities vary as the square root of the slope, the following equation may be written
$$\frac{L}{30} = \frac{\sqrt{S}}{\sqrt{.005}}$$
 which reduces to $L = 424 \sqrt{S}$.

Thus for longitudinal pavement grade of .2% the inlet would be 21' in length, and for a .5% gradient, the length would be 30 feet.

A reinforced concrete storm sewer of the proper size was laid paralleling the runway at a distance of 11 feet and discharging into trunk line sewers of large reinforced concrete pipe or box. The operation of this storm water drainage system has proved satisfactory and favorable comment has been received because of the complete and rapid drainage of the runways and field area.

All the above described construction was completed early in 1942. In the meantime the Park Board had acquired an additional 880 acres of land on three sides of the original 640-acre field, to provide for future expansion and to protect approach areas to the runways being constructed. To further protect approach areas, agreements had been worked out with



Street entrance of Administration building.

the Southwest Bell Telephone Company, the Kansas Gas & Electric Company, and the Empire Pipe Line Company to remove heavy telephone and power pole lines from all four sides of the original 640-acre field and relocate them at a location remote from the field, from which location necessary service to the Airport was established by means of underground cables. Also contracts were made with the Santa Fe Railway Company to extend a spur track for the delivery of materials and equipment directly onto the Airport. Also there was constructed during this period a large sanitary sewer from the Airport to the city's sewage disposal plant; a National Guard hangar, armory, and garage buildings for the 127th Observation Squadron of the National Guard; a large underground fuel supply system capable of storing a train load of gasoline; a control tower with all radio equipment; two large additions in the form of wings to the administration building, and a remote radio transmitter station, as well as many minor improvements to the Airport.

In addition to carrying on this rather extensive construction program at the Airport as well as con-

Wichita's Municipal Airport

With a total area of 1,840 acres, the runways and other paved areas include enough concrete to make 180 miles of 20-foot roads. Air line and military traffic and testing of B-29 Superfortresses continued during the enlargement operations.



Recent picture of field side of Administration building.

siderable construction in the Wichita park system, the Park Board made topographical surveys of the additional land purchased for Airport expansion and a complete master plan in general detail for all future runway and airport expansion.

During the grading and construction of the runways, grades were worked out for future intersection points and dowels placed in the slabs and ducts laid under them to provide for the paving and lighting of future dual runways.

Early in 1942 it became apparent that a large bomber-type airplane was to be produced in large quantities at the Boeing Airplane Plant No. 2 adjacent to the Airport, which plant was being greatly enlarged at that time. In order to be able to handle properly any airplane that might be produced by this plant, the Board of Park Commissioners requested that a program of runways and field enlargement be started. This request was made to the Civil Aeronautics Authority through the Army Air Forces Midwestern Procurement Division. In due time this request was



No. 1 municipal hangar.

approved and AP-4 Lease agreement entered into by the Board of Park Commissioners and the C.A.A. Due to the size of the project and the speed required in getting it constructed, the C.A.A. requested the Corps of Engineers to handle the construction in cooperation with the C.A.A. Airport Division. Plans and estimates were completed early in May, bids were taken on May 20, 1943, and the general contract awarded to the San-Ore, Miller-Clarkson Construction Company of Dodge City, Kansas; and by the first of June the contractor had construction work under way.

In addition to this work, a lease had been completed previously by the Board of Park Commissioners to the Defense Plant Corporation for the construction of target butts, utilities, and approximately 25 acres of concrete airplane parking area. The general design, plans, grade and location of these aprons were worked out by the Park Board and the construction was handled by the Austin Company for the Defense Plant Corporation.

Due to the large number of military aircraft being produced by the Cessna Aircraft Company, it had become necessary for the Cessna Factory to have access to the hard-surfaced runways at the Airport and a taxi strip from their plant connecting to the taxi strips planned on the Airport was designed by the Park Board so that a portion of it could become a part of the Airport runway system should further expansion be necessary at a later date. This construction contract was awarded to the Armagost Construction Company of Wichita, Kansas.

The main field development project had been set up on a 90-day schedule, and all of this principal construction was completed within that time. One of the most complex features of this construction program was that not only must all air line—T.W.A., Braniff,



National Guard hangar and armory building.

and Continental—and military traffic be safely accommodated, but that the testing of the new Boeing B-29 Super-fortress, then beginning to come off the production line, be given every consideration possible so that not the slightest delay be incurred in its production schedule; and also that certain testing necessary for Beech, Cessna, and Culver Airplanes could be carried on. With this in mind, the field construction schedule was set up through the Army Air Force Procurement Division, Contractors, Corps of Engineers, safety engineer, and Airport Field management, to a definite procedure. Walkee-talkie, radio communication and light gun signals from the control tower were employed for control of all operations on the field that might endanger airplane operation. The excellent planning and perfect coordination of all concerned is shown in that the control tower records listed 78,097 airplane operations, or an average of an operation every minute and forty seconds on the field, during the entire three months of heavy construction work; and meantime there were in operation on the field well over 400 pieces of heavy construction equipment, including three double-drum Koehring pavers, numerous drag lines, cranes, and almost every make and type of construction machinery used for earth work, concrete paving, storm sewer construction and bituminous paving, together with approximately 1500 men employed on this project 24 hrs. a day, and yet not one single accident occurred due to the construction operation, even though the landing field was restricted to less than one-fourth of its normal area for several days during this 90-day construction period.

The main runway and field extension improvement project included the following work:

The extending of the existing north-south and the northwest-southeast runways from 4500 to 7500 feet length.

The construction of a second north-south runway 7500 feet long by 300 feet wide.

The extending of the length of the existing east-west runway from 4500 feet to 5000 feet.

The construction of a second east-west runway 6000 feet long by 300 feet wide.

The construction of 25,000 lineal feet of 100-foot width taxi-ways connecting all runways.

The construction of approximately eight acres of additional concrete parking and servicing aprons, together with approximately $2\frac{1}{4}$ million cubic yards of earth excavation.

The extension of all storm water sewers, runway and field lighting, fence, etc.

In order to give approach clearance for the new runways it was necessary for the Park Board to purchase an additional 240 acres of land, bringing the total acreage in the field up to 1840 acres. The existing runways were extended by paving with unreinforced concrete having an 11"-8"-11" section. The two new runways were paved 150 feet wide with unreinforced concrete, 15"-10"-15" section, and had an additional 150 feet of width added by constructing a 75-foot limited shoulder pavement on each side of the

concrete pavement, made with a 16" stabilized base with 3" hot asphalt wearing surface. All taxi-ways were of reinforced concrete 15"-10"-15" section pavement, 75 feet wide with a $12\frac{1}{2}$ -foot limited service shoulder on each side constructed of 16" stabilized base and 3" hot asphalt wearing surface. Storm-water sewers were all constructed of reinforced concrete pipe, the large mains being multiple runs of 60" pipe; approximately 20,000 feet of pipe being used. All drainage structures were constructed of reinforced concrete.

The most remarkable thing in regard to this work was that all the various agencies who participated in this enlargement and construction work cooperated and worked in close harmony with the Park Board by adhering to the master airport plan, which had been previously developed, and followed this plan with only the very slightest deviation, and that in minor points only.

Some idea of the extent of paving involved in the construction of this Airport can best be given by the fact that its square yardage is equivalent to that of 111 miles of 20-foot highway paving; or, due to the greater depth of pavement section, the cubic yards of concrete required to construct this Airport pavement would pave to average highway section a 20-foot pavement 180 miles long.

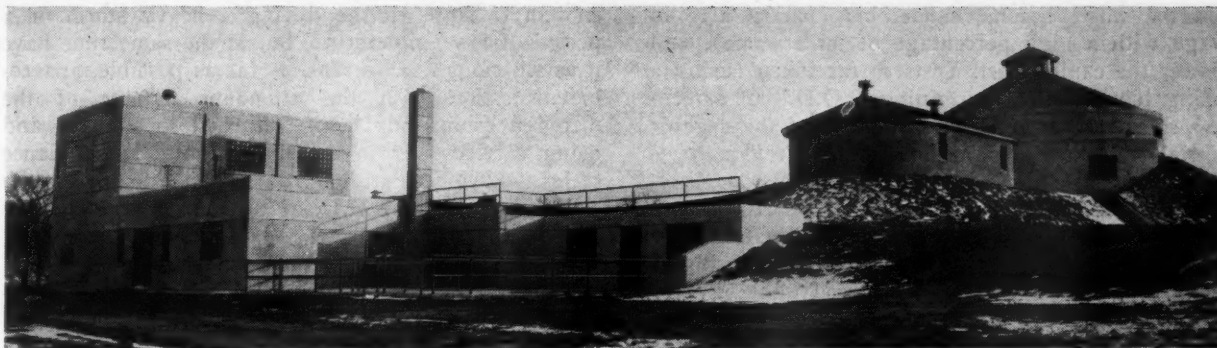
It was necessary in this expansion work to remove, within a short space of time, five sets of farm improvements from the additional land acquired, one of which was a large hog farm where all the garbage from the city of Wichita was disposed of. This farm had many buildings, concrete feeding platforms and other improvements necessary to accommodate the many thousands of hogs occupying it, and it required considerable planning and working around these improvements until another location could be sufficiently developed by the owner, and the hogs moved so no interruption or delay might occur to either the construction of this vitally needed airport or the garbage service of the city, this service being particularly important from the standpoint of the city's health and sanitation.

It was also necessary to close $4\frac{1}{2}$ miles of well-improved country road by legal process, and all necessary steps had been completed so that mail routes could be relocated and roads closed before the project was started. Another operation required was the lowering of an 18" high-pressure gas line below pavement grades and the ultimate removing of it completely away from the Airport. In spite of all these complications, this great Airport development progressed on schedule with wonderful cooperation and agreement;

(Continued on page 20)



A portion of the concrete servicing apron.



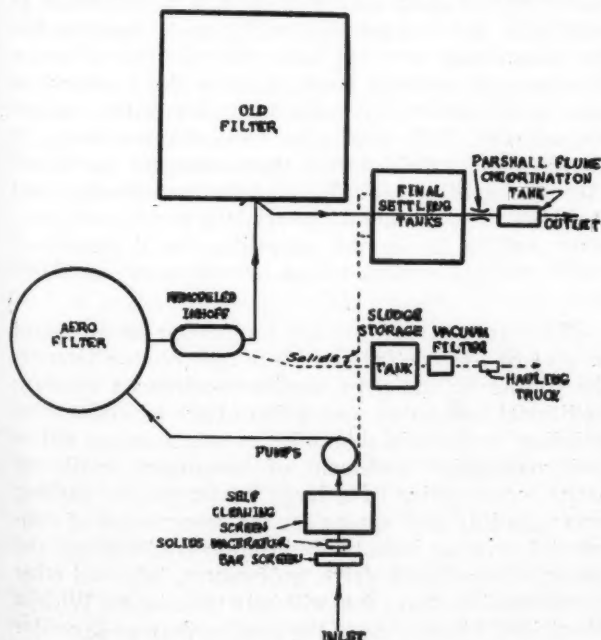
General view of the Detroit Lakes sewage treatment plant.

Modernization of the Sewage Treatment Plant at Detroit Lakes, Minnesota

Algae growth in lakes receiving effluent controlled by reducing its nitrate and organic contents, by means of a plant embodying some unusual features.

By WINSTON C. LARSON
Consulting Engineer

DETROIT Lakes, Minnesota is a city with a permanent population slightly over 5,000 and, because the many fine lakes in and adjacent to the city make it an excellent summer resort, with a considerably higher summer population. The city in 1940 had a waste treatment plant which included a typical Imhoff tank, fixed-nozzle type low-capacity rock filter, and humus tank, with its effluent emptying into a small stream connected with the chain of lakes.



Diagrammatic plan of Detroit Lakes treatment plant.

This plant was obviously overloaded and some of the lakes in the immediate vicinity of the city had become weedy and the algae growth was quite objectionable. The fundamental problem was bio-chemical and before proceeding with plans for modernization of the treatment plant, a study of the problem was made by a bio-chemist experienced in waste treatment. His report emphasized the necessity of eliminating nitrate fertilization of the lakes and reducing, insofar as was economically possible, the organic load discharged from the treatment plant.

To meet these two general requirements and at the same time keep the costs down by utilizing as much of the existing treatment plant as possible, it was decided to reconstruct the plant as a double-stage biological filter plant with vacuum filtration of the sludge. To accomplish this, there were incorporated in the design of the plant certain features that were unusual, at least in the combination therein made of them.

In the reconstructed plant the incoming waste passes through a North self-cleaning fine screen to a high-capacity Aero-filter with an Aero-block tile medium; then through the Imhoff tank, remodelled as a settling tank, to the low-capacity fixed-nozzle type filter rated at 4 mgad and to rectangular final settling tanks. The solids from the screen and settling tanks are pumped to a holding tank with a short detention period, from which they are taken and dewatered by the vacuum filter and hauled to farm land as fertilizer.

The fine screen was installed to avoid the detention period which would be necessary with a primary tank, thus eliminating many of the odors frequently found

when the waste becomes anaerobic (particularly in sewage with a high percentage of milk waste), and to lower the capital cost. Tests so far taken (using a Waring blender for determining B.O.D.'s of screenings) show that an average of 12.2% of the organic material is removed by the fine screen. Previous tests had shown that a fine screen followed by an Aero-filter with tile filtering medium and a settling tank would remove 20% more than the combination of a rock medium filter and settling tank following a primary tank. This increase is caused either by the increased efficiency of the tile medium or by removal by the intermediate settling tank of the solids passed by the fine screen. The tile medium was chosen because it is a prefabricated uniform material constructed like a huge swiss cheese, with vertical one-inch holes, which thus eliminates pockets found in a rock filter where anaerobic digestion can occur with consequent return of the nitrogen compounds to solution. The high-capacity Aero-filter was chosen because of the recognized low nitrified effluent from these filters and low cost.

It was the original intention to mechanize the Imhoff tank when it was remodelled as a settling tank, but this was not done and for the past two years it has been operated as a plain settling tank. This lack of mechanization has necessitated constant squeegeeing and has not operated satisfactorily, the material deposited on the walls frequently becoming anaerobic and being carried over the effluent weir. This intermediate tank is to be mechanized when such equipment is available after the war, and materially improved results can then be expected.

The old low-capacity fixed-nozzle filter was carefully checked to be sure that the sustained momentary application rate would not be excessive at the average daily rate of 4 mgad and it was found that the dosing tank would permit reasonably short cycles.

A new final settling tank was constructed to permit an adequate settling period. This tank was followed by a Parshall flume and chlorination tank.

The holding tank in which the screenings and sludge are collected was designed on the basis of 2 cubic feet per capita. Since Detroit Lakes is in the northern climate zone, it was necessary to have this tank big

enough to store sludge during a heavy storm or a period of low temperature, but at the same time have it small enough to prevent, as far as possible, anaerobic digestion with the attendant danger of the nitrogen compounds being returned to solution and being carried over in the supernatant. This balance seems to have been attained, as tests to date have shown an average 5-day B.O.D. of the supernatant of only 250.

The vacuum filter has operated very satisfactorily, and the sludge cake has been used without difficulty on nearby farms as fertilizer as fast as available.

A copy of a special series of tests made by the U. S. Public Health Service is included herewith. Excellent as the removals have been, the correction of the faulty intermediate tank will doubtless bring even better results.

Since costs are vitally important to every municipality, it is interesting to report that, as a W.P.A. project, the cost to the city of this remodelled plant was but \$58,000, which is less than \$12 per capita. The operator finds the plant easy to take care of and, since there is no digester, free from the hazard of explosive gases.

Enlargement of Wichita's Municipal Airport

(Continued from page 18)

and, I might say, with the least friction and delay of any project that I have ever come in contact with where so many different interests and agencies were involved.

Since the completion of the field, it has carried a tremendous amount of traffic—probably the greatest in tonnage of any field in the country. And above all, this municipal field is helping out tremendously in the war effort by giving the great B-29 Super-fortress, as well as all of the Wichita-made airplanes, an adequate and safe field from which to make their test flights.

Wichita and all who have participated in the development of this fine airport can always look upon it with a feeling of just pride because when the war emergency is over, this airport will be adequate to handle the heavy peace-time traffic that is bound to follow immediately with the same efficiency that it is now handling the military needs, because the construction was coordinated to a definite predetermined master airport plan. This plan gave clear approaches to all runways and a field design that makes for rapid and efficient handling of all airplane movements; and should it ever become necessary, the north-south runways (which lie in the prevailing wind direction) could easily be extended to an overall length of 42,000 feet.

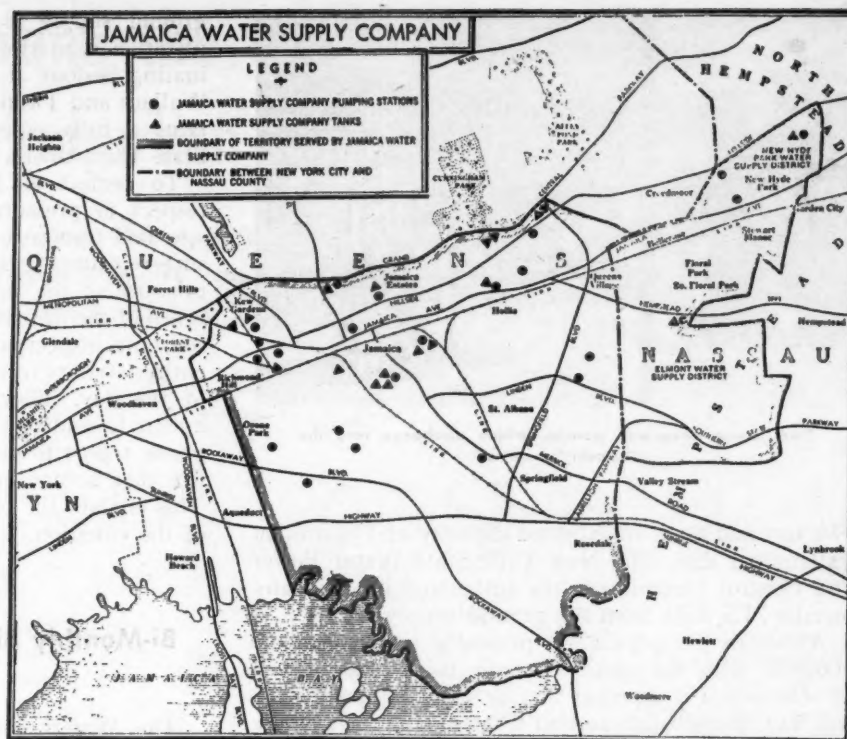
Plans are now being made for further improvement as post-war work. This post-war construction includes the paving of one more northwest-southeast runway; additional taxi-strips; expansion of the administration building on the field side to better accommodate airline and commercial movement of passengers, mail and cargo; construction of a large passenger car parking area; grading and aprons for the construction of commercial aviation industry buildings; landscaping, and construction of park drive, golf course, lake and other recreational features that will help to make the Wichita Municipal Airport one of the most modern and popular airports in the nation.

JOINT TESTS BY MINNESOTA STATE BOARD OF HEALTH AND U. S. PUBLIC HEALTH SERVICE

Summary of Flow and Analytical Data, Detroit Lakes Sewage Treatment Plant, July 31-August 3, 1944

	7/31-8/1	8/1-8/2	8/2-8/3
1. Flows (to wet well)			
(a) G.P.M. (Average)	306	297	323
(b) G.P.D. (Total)	441,000	428,000	465,000
2. 5-Day B.O.D. in ppm			
(Screen effluent to wet well) ..	394	237	297
3. Screenings			
(a) 5-day B.O.D. (ppm)	5,590	7,120	5,230
(b) G.P.D.	440	276	604
4. 5-day B.O.D. in ppm			
(Calculated raw sewage strength)	395	240	301
5. Supernatant sludge liquor			
(a) 5-day B.O.D. (ppm)	139	249	300
(b) G.P.D.	3,140	2,625	3,155
6. Pounds 5-day B.O.D. applied to primary filter per acre-foot, including supernatant sludge liquor	5,200	3,020	4,000
7. 5-day B.O.D. (ppm) to secondary filter	43	25	51
8. Pounds 5-day B.O.D. applied to secondary filter per acre foot ..	80.4	45.2	100
9. 5-day B.O.D. in ppm. Effluent...	6.7	7.5	20

Territory served by Jamaica Water Supply Company, showing locations of pumping stations and tanks.



Deep Well Water Supply of Jamaica, New York

Its well and pumping capacity is more than double the average demand. The distribution system is thoroughly gridironed. Pressure throughout maintained by inspection six times daily of 43 widely distributed pressure recording gauges.

By PETER LEY

Superintendent, Jamaica Water Supply Company

BEFORE the western end of Long Island became a part of "Greater New York," and for some time thereafter, all of its water supply was obtained from deep wells. This area included Brooklyn and several smaller communities, and the water utilities were publicly owned in some cases, in others were private companies. (A considerable part of this area is now served with water from the city's Catskill supply.)

Of the private companies, by far the largest was the Jamaica Water Supply Company; in fact, with the possible exception of the Indianapolis Water Company it is the largest privately owned and operated water utility in the United States. Incorporated in 1887 and operating through only 6 miles of mains, it has grown until today it serves a population of more than 400,000 through about 675 miles of mains, supplying about 32 mgd. Only 3.75% of the mains are less than 6 inches in diameter. The area served, about 40 square miles, is chiefly in the Borough of Queens, New York City, and 11 square miles of the adjacent westerly part of Nassau County.

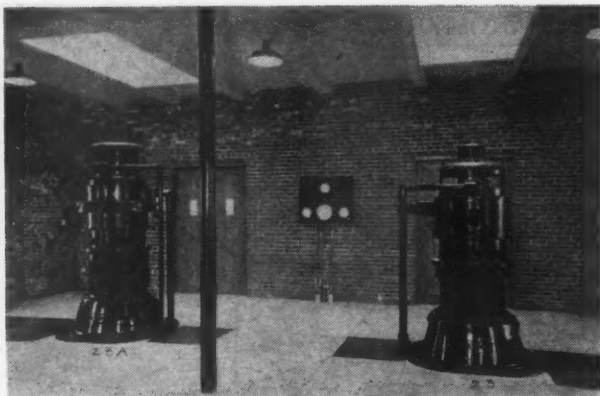
All the water is drawn by 24 pumping stations from 43 deep wells with a total capacity of 66.5 mgd, or more than double the average daily demand. Both wells and pumping stations are distributed over a

large part of the area served, all interconnected with each other and with a well gridironed distribution system. This system reduces the need for large transmission lines.

The company obtains its water supply from its own wells, located within the territory it serves. These wells are sunk an average of one mile apart. Their distribution throughout the system is indicated on the accompanying map, which shows also the locations of pumping stations and tanks. The source is the underground water stored at various levels in the sands and gravels of western Long Island, and is entirely derived from local rainfall. (A former theory that these Long Island wells tapped a vast underground supply extending beneath Long Island Sound and fed from the New York and Connecticut mainland has been discredited.)

The wells are the Layne gravel wall type, designed to permit removal of abundant water from the sand found in that locality without causing sand jamming around the screen.

The Jamaica company's wells tap four of these water-bearing formations. The shallowest well is 60 feet deep, the deepest until now has been 625 feet, but a new well being sunk at New Hyde Park will go down



Two Layne deep-well pumps, which discharge into the "saucer" reservoir.

730 feet and have an expected capacity of $1\frac{3}{4}$ million gallons per day. The New York State Water Power and Control Commission has authorized the company to take 71.5 mgd from the ground supply.

Although the population presently served is some 400,000, with the steady growth being experienced by this area it is expected that by 1955 this population will have increased to around 600,000, and the average demand be lifted thereby from today's 32 mgd to approximately 40 mgd.

It is of interest that studies over the past ten years have shown that the average underground water table level, as revealed by monthly checks, has not dropped due to the company's pumpings. Which indicates that the populous counties of Nassau and Suffolk to the east of Queens are in no sense being robbed of supply for their own present or future needs.

Since the company's wells are sunk to these varying depths and are widely distributed over its territory, equitable extraction of water without forming dangerous local "cones" in the water table is a feature.

Comparing this system with one drawing water from a surface supply by means of a single pumping plant or by gravity, through one or two long potentially vulnerable supply mains, there seems little probability of the headaches so often suffered by managers of surface supplies due to the failure or flooding of their pumps, breakage of the supply line, or lowering of water in the reservoirs due to drought.

All of the 43 wells in service are equipped with Layne pumps. Of these, 29 are high-pressure vertical turbine pumps driven by electric motors mounted on foundations at floor grade, which discharge directly into the distribution mains, and 14 wells are similarly equipped, except that the pumps discharge into steel reservoirs. At the location of these reservoirs, which furnish a combined storage of 13,000,000 gal., electrically driven horizontal, centrifugal booster pumps with a combined capacity of 38 mgd pump the water from reservoirs into the mains.

A unique feature of the reservoir system is one in St. Albans, L. I., built of steel in "saucer" shape, resting directly on the ground, 2 feet deep at its sides but 21 feet deep in the center. It was so designed because this reservoir is located in a closely built up residential area and it was desired to make it as inconspicuous as possible, for aesthetic reasons. This aim was further carried out by roofing it over and by landscaping and shrubbery plantings about it which serve almost completely to conceal it from nearby residents or passers-by.

Purification of water from this source of under-

ground supply is generally unnecessary. The only filtration is at two locations, for iron-removal. Chlorinating is done at some eight or nine locations, using Wallace and Tiernan chlorinators. The company maintains a fully equipped laboratory, approved by the State Department of Health.

To perfect as far as possible the situation with respect to pressure maintenance, a patrol system is operated from a central dispatching office and 42 pressure recording gauges are maintained upon which the pressure of the water in the main is recorded at all times of the day and night. These pressures are under constant inspection by the patrolmen who cover the entire territory of the company throughout the 24 hours of the day. They report hourly to the dispatching agent. In addition, the Fire Department makes a telephone report to this central dispatching office of each fire that occurs in the territory of over two alarms. This enables the company to foresee the requirements of the situation.

Bi-Monthly Billing by Pasadena's Water Department

The Water and Light Department of Pasadena, California, began on January 1, 1944, bi-monthly reading of meters. In his annual report to City Manager C. W. Koiner, Morris S. Jones, Chief Engineer and General Manager of the Water Department, said: "Under this plan, meters are read and consumers are billed for light and water service every two months instead of every month, except that some of the larger consumers are still billed each month. This procedure saves a portion of meter reading, billing, and collecting time, as well as postage, and so far has proved very satisfactory. The saving to the water department in the first six-month period that bi-monthly meter reading and billing was used amounted to \$4,443.68.

"The number of metered services as of June 30, 1944 was 30,125. . . . Of this number, 24,122 or 80% are within the city and 6,003 or 20% are in unincorporated areas." The meters are classified by sizes as follows: 23,015 are $\frac{5}{8}$ ", 963 are $\frac{3}{4}$ ", 5,060 are 1", 499 are $1\frac{1}{2}$ ", 487 are 2", 9 are 3", 18 are 4", and 5 are 6". The remaining 69 are of various sizes on irrigation services. All domestic services have been metered since 1930.

The total gross revenues for the year were \$1,062,334.97. The total operation and maintenance expense, including the city's Metropolitan Water District obligation and contribution to the general fund of the city, was \$915,859.02. During the past eight years part or all of the city's expense as a member of the Water District has been paid from the water funds, these contributions to date totaling \$1,969,770.

On November 3, 1942, the electors of the city approved a charter amendment appropriating for general city purposes 6% of the income from the sale of water. This payment last year plus that to the Metropolitan Water District amounted to 42% of the department's gross revenue.

The department now has a surplus of \$1,508,500 par value of federal and municipal securities, accumulated as a reserve against a possible emergency and to finance future construction. Since the beginning of hostilities the funds that would have been spent for improvements and additions to the system have been added to surplus and will be used in postwar construction.

Regulating the Development of Suburban Property

In Baton Rouge, unless developers of suburban property file plans of street layout approved by the parish, sales of lots will not be recorded nor building permits issued.

By J. T. BULLEN

M. Am. Soc. C. E.

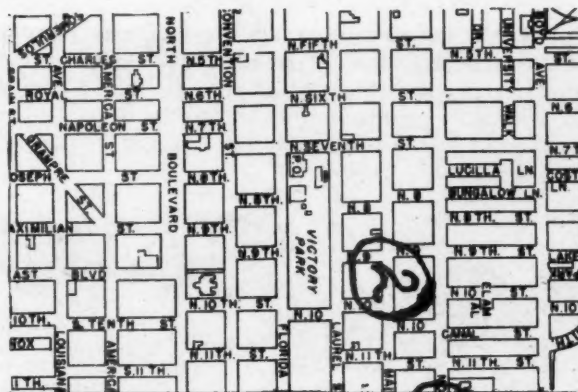
BATON ROUGE, LA., is now a community of over one hundred thousand; but only about 35,000 of these live within the corporate limits, which means that over 65,000 people live in the suburbs, outside the jurisdiction of the city.

Any public utilities to serve this scattered population must be provided by the individual land owners, the real estate developers, or the Police Jury of East Baton Rouge Parish. (Police Juries in Louisiana are relatively the same as County Commissioners or Boards of Revenue of counties in other states.)

The very rapid growth of Baton Rouge within the last ten years, and particularly in the last five years, has caused the opening and settlement of a number of new sub-divisions. Some of these sub-divisions have adequate lights, water, paving, sewerage and drainage. But unfortunately many have scarcely any improvements and, as is usual where there is no ordinance governing the opening of sub-divisions, there is a hodge podge of streets, poorly graded and without drainage or surfacing or any utilities.

The developers have been able to sell lots at a very moderate figure—sometimes as low as \$25 for a small lot—and still give them a nice profit. As the influx of people at Baton Rouge increased (drawn by the demand for labor at huge industries) these cheap lots have been purchased and homes erected on them.

Rainfall at Baton Rouge for July averages 6.84 inches; the annual rainfall averages 59 inches and it sometimes rains as much as 90 inches in twelve months, and that is some rain. As the soil is chiefly a brown silty clay, streets which are unsurfaced become almost



Another illustration of non-continuity of streets.

impassable, and when such a condition arises there is a great hue and cry for the street paving.

The demand is also insistent for fire protection, sewerage, city water, adequate drainage, etc., equal to that provided within the city limits. Those outside the city seem to forget that the residents of the city have been assessed for their utilities and pay a city tax as well as paying the Parish (County) tax. So pressure is brought to bear on the jurors representing each ward and that pressure is so insistent that presently the Police Jury undertakes to supply the utilities which should have been provided by the sub-division developer in the first place.

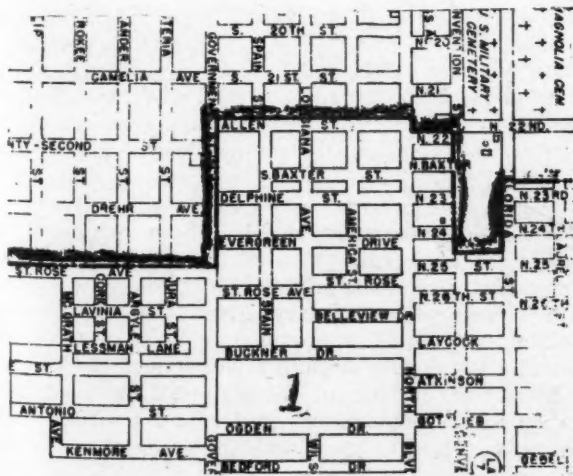
As an illustration of how this burden on the general taxpayer grows, the Police Jury budget for collection and disposal of garbage (outside the city) in East Baton Rouge Parish for 1945 is \$85,000.

Large sums will be required for drainage and street surfacing, sewerage extensions, fire protection, etc., all of which now falls as a burden on the taxpayers but should have been paid for by sub-division developers and eventually by the purchasers of lots in the sub-division.

Many years ago I persuaded the Police Jury of Caddo Parish to pass an ordinance regulating, to a slight extent, the opening of sub-divisions within five miles of incorporated cities, and only recently the Planning Board of the City of Shreveport has had the City Council pass ordinances strictly regulating the sub-division of land within the city.

Recently I drafted an ordinance for East Baton Rouge Parish, which was enacted into law in October, 1944, and will go far toward insuring an orderly growth of Baton Rouge. To my surprise the real estate

(Continued on page 63)



Illustration, along Government St. and North Blvd., of non-continuity of streets in adjoining sections.

Test on Virginia Road of a New Resinoid

Details of a test made last year by the State Highway Department on a heavy clay road in Virginia.

DURING the past ten years the Hercules Powder Co. has developed a resinous derivative of the southern pine tree which, when properly mixed with a soil, is found to waterproof it. During its development it was used in the construction of several test roads,



Spotting the bags along the road.



Spreading the material while emptying the bags.



Scarifying to a depth of 6 inches.

but it was not until early in 1944 that it was offered as a soil stabilizer under the name "Stabinol," and it is still undergoing improvement tests in the company's soils laboratory at Wilmington, Delaware. One of the test roads in this country (it is being used overseas by army engineers) was built several months ago near Farmville, Va., connecting with a state highway near Hampden Sidney College.

The soil here was predominantly heavy clay with a high mica content, classified as A5-A7 Public Roads Administration standard. An analysis of it at Hercules' soils laboratory was as follows:

HYDROMETER ANALYSIS ON MATERIAL PASSING NO. 10 SIEVE

	Per Cent
Passed No. 10 sieve.....	93
Total sand (2.0-0.05 mm.).....	50
Silt (0.05 to 0.005 mm.).....	14
Clay (.005 to 0.001 mm.).....	15
Colloids (less than .001 mm.).....	21

SOIL CONSTANTS

Liquid limit	43
Plastic limit	26
Plasticity index	17
Shrinkage limit	22
Volumetric change	36
Optimum moisture (%)	17
Maximum density (lb./cu. ft.).....	112
pH of soil	4.8
Type soil	A5-A7
Color	Red-brown

This analysis showed that it would take 10 pounds of Stabinol for every square yard of soil.

In building the test road the 75-pound bags of Stabinol were spotted at intervals of three feet along the one-half mile of road to be treated and the material was spread by hand until a layer covered the entire width of the 22-foot road. The road was then scarified and, when the base had been thoroughly broken up to a depth of six inches, the preliminary mixing of the resinous chemical with the soil was accomplished with two spring-tooth harrows and a 10-foot disc harrow.

When preliminary mixing had been completed, a three-blade turn plow was used to turn the bottom of the base up for further mixing. Final mixing was done with a tractor-drawn rotary mixer, and this process was continued until approximately 90% of the road material would pass through a No. 4 sieve.

After final mixing of the material, the road was shaped with a motor patrol grader, and a spring-tooth harrow was used to break up compaction planes made by the wheels of the grader.

The base was then "walked out" with a sheepfoot roller, to within one-half inch of the surface and (be-

oil Stabilizer

By **WILLIAM H. BURNSIDE**

Field Engineer, Hercules Powder Co.

cause the soil had dried out too much) water was added from a distributor truck to bring the moisture up to optimum.

The sheepfoot roller and the spike-tooth harrow were used to work the water into the base. After the water was worked in, a whobble-wheel roller was used to finish off the surface. The base was then rolled a few times and the patrol grader used to remove about one inch of material from the surface by blading from the center of the road toward each edge.

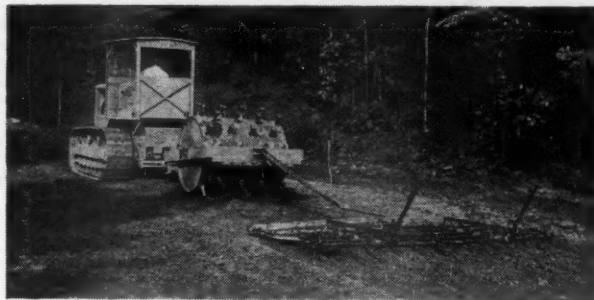
When the prepared base had dried out to approximately 60% of optimum it was surfaced, one-half of it at a time. The half-road was primed with 0.3 gallon of RT 4 per square yard, covered with a light coat of sand, primed again, followed by 40 pounds of No. 12 stone chips distributed over the surface and rolled with a smooth-wheel roller. (Hercules does not recommend using a Stabinol base until it has been surfaced, except for very light traffic, such as from a main highway to a farm house or residence.)

Virginia highway engineers intend to make studies of Stabinol's traffic-resisting qualities under extreme conditions.

The engineer force in charge of the construction included: C. F. Mullen, chief highway engineer; Shreve Clark, testing engineer; K. G. McWane, division engineer, and W. W. Nickles, resident engineer, all of the Virginia Highway Department. Evert Mayfield is in charge of Hercules Naval Stores sales to the highway construction industry, and C. F. Moss supervises the soils laboratory at Wilmington.



Mixing into the soil with spring-tooth harrows and a 10-foot disc harrow.



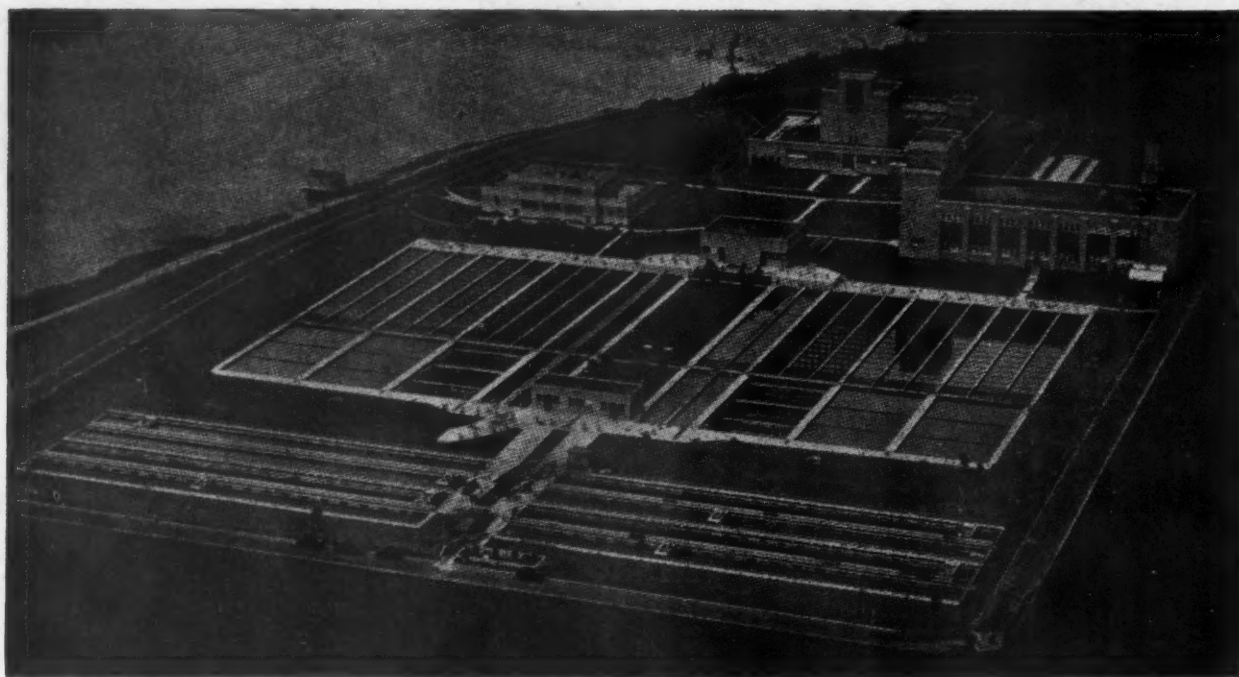
Using the sheepfoot roller.



Finishing the surface with a wobble-wheel roller.



Base completed, ready for applying the bituminous surface.



General view of the "Twin Cities" treatment plant, looking north or up the river.

Vacuum Filtration at the Minneapolis-St. Paul Plant

Sludge concentrated, conditioned, filtered and incinerated. Chemical dosage, life of filter cloth, eliminating carbonate deposit in pipes, and other details discussed.

THE Minneapolis-St. Paul sewage treatment plant dewateres its sludge by vacuum filtration preparatory to incineration, using for this purpose six Oliver filters, each 11 ft. 6 in. in diameter and 14 ft. long, having 500 sq. ft. of effective filter area. Prior to filtering, the sludge is pumped from the settling tanks to two concentration tanks, where it is held for a usual maximum of three days, increasing the solids concentration from an average for the year 1943 of 8.29% in the settling tank effluent to 9.47% in the concentration effluent.

The sludge from the concentration tanks is conveyed by pipe lines in tunnel to two sumps in the filter building which feed two bucket elevators, each with a maximum capacity of 480 g.p.m. These elevators discharge into two 2,000-gal. air-agitated conditioning tanks. From these tanks the sludge discharges by gravity into the six vacuum filters arranged in two batteries of three units each. A total of 78,900,000 gal. of concentrated sludge was filtered during the year, giving filter cake with an average moisture content of 66.6% and volatile content of 61.3%.

The quantity of ferric chloride used averaged 1.12% of the weight of the dry sewage solids, and of lime, expressed on a calcium oxide basis, 3.05%. The quantities of ferric oxide used during 1939 to 1942 were 2.1%, 1.92%, 1.53% and 1.20% respectively; while the figures for lime were 5.68%, 4.76%, 3.77%

and 3.44%. The gradual, definite and continual reduction in the amounts of chemicals used has resulted from improvements in operating details and careful and conscientious operation by the members of the staff.

The average life of filter cloth was 461 hours during 1943, which compares with 493 hours in 1942, 355 hours in 1941, 326 hours in 1940, and 170 hours in 1939. The average filter rate has been progressively reduced as a means of saving chemicals, from 5.50 pounds per square foot per hour, to 3.47%, both expressed on a dry basis. An average of 277.5 tons of filter cake was produced daily, containing an average of 92.8 tons of dry solids. The total quantity of filter cake produced during 1943 was 96,830.2 tons. The quantity of sludge produced was considerably higher than anticipated at the time of design, at which time it was expected that 76 tons of dry sewage solids would be removed daily. The increased quantity is due to higher sewage strength and greater removal by the plant than originally expected.

During the year 1943 the use of acid containing an inhibitor in the cleaning of the drums and screens of the vacuum filters and for prolonging the life of filter cloth was continued. The life of the cloth was extended to an average of approximately 450 hours by cleaning the cloth with acid after approximately 300 hours of use.

(Continued on page 51)

Maintaining Floors on California's Highway Bridges

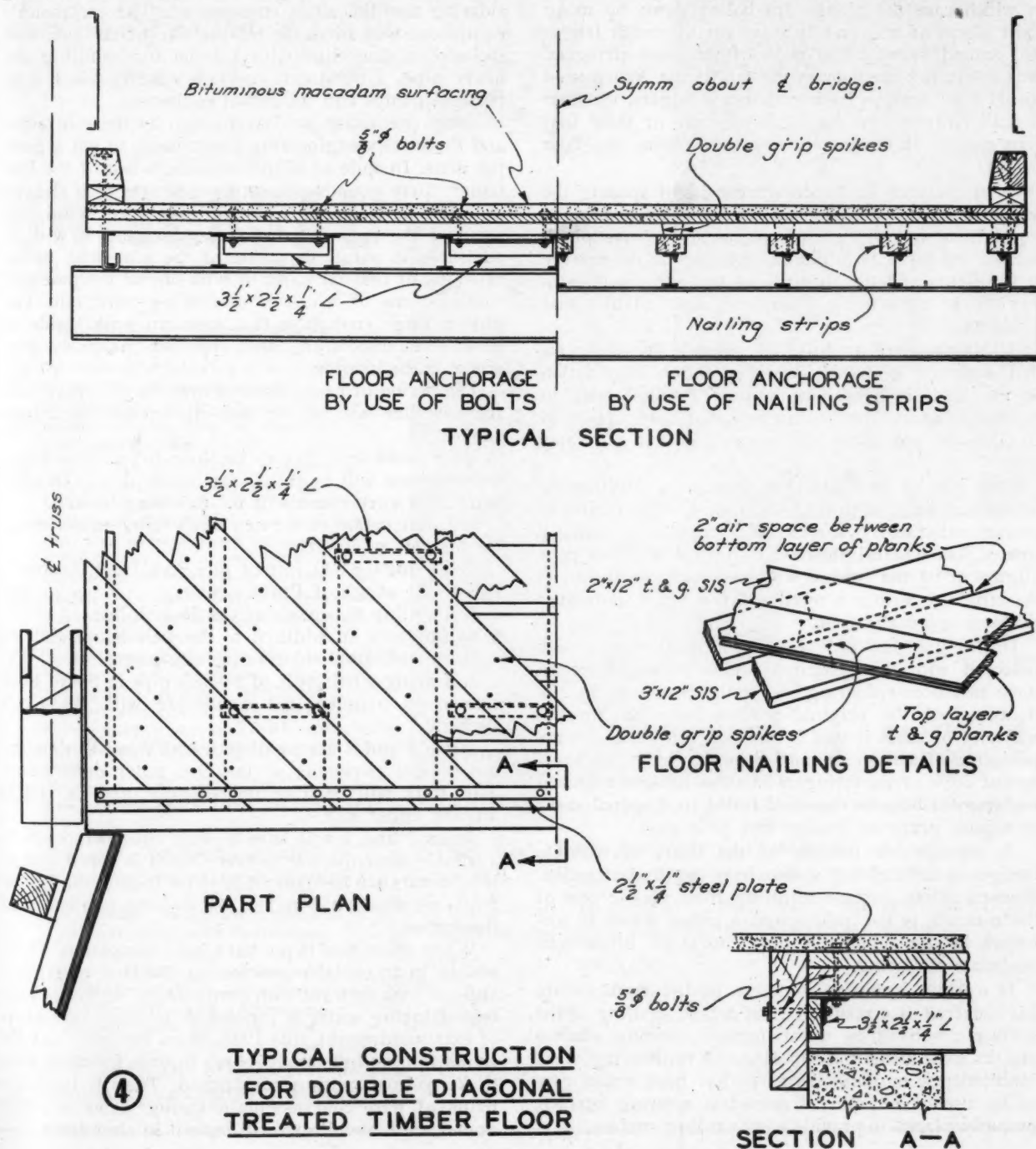
Three types used in reconstruction of floors as a feature of maintaining the 4,636 bridges on the state highway system. Details of construction of double diagonal timber floors.

THERE are 4,636 bridges on California's state highways, of which 3,142 are built of steel and concrete and 1,394 of timber or of steel with timber approaches.

In the maintenance of timber bridges and old steel ones the floor is the most vulnerable portion, since it is subjected directly to damage caused by traffic loads greater than those it was designed for. Reconstruction

of floors often seems necessary and decision whether to reconstruct is usually governed by two major considerations: the dead load that the existing structural members can carry safely, and the estimated remaining service life of the structure before complete replacement will be necessary.

The Bridge Department of California's Division of



Highways uses three types of floors in this reconstruction work: Reinforced concrete, open steel grating, and double diagonal treated timber with a suitable wearing surface.

Reinforced concrete is used where the existing structure can safely support its relatively high dead load and the estimated remaining life of the structure warrants it. Open steel grating is generally restricted to lift spans (where it is desirable to keep the dead load at a minimum) that will not have to carry loose livestock. Timber floors are used where the trusses are too light to carry a concrete floor, and on movable bridges where provision must be made for the passage of livestock.

The illustration shows typical details for treated timber floors as now being used on steel trusses. The floor block is secured to the steel stringers with double-grip spikes extending into nailing strips which are bolted to the top flange of the stringers. In many instances the original design did not use nailing strips, in which case the planks are bolted down by using short pieces of angles which are cut to proper length and extend between the webs of the steel stringers, thus anchoring the floor to the top flange. When used on old steel bridges having timber stringers, the floor is nailed directly to the stringers, any of these that may require it being replaced at the time the floor is laid.

Other features in the design consist of spacing the bottom layer of plank sufficiently far apart to provide ventilation, and the use of tongue-and-groove plank for the top layer to minimize cracking of the surface at the joints and the entrance of moisture; both with a view to preventing decay of floor planks and stringers.

Although there is little to substantiate the view that diagonal planking provides better distribution of the load, it does have a very definite value in reducing impact, due to the fact that both wheels of an axle do not strike the same plank at the same time.

This type of floor has been used on a considerable number of bridges during the past few years and is giving satisfactory service. The timber is usually treated, but where light design, narrow width or poor alignment of the bridge will require replacement of the structure within a relatively few years, untreated timber is generally used.

During the past two years 32 timber bridges were refloored with this diagonal timber construction. In some instances reflooring was made necessary by the decaying of the original timber floor, but in the majority of cases it was because of failure under the pounding of a large volume of heavy traffic. An average of 20% of the stringers in these bridges required replacement because they had failed in diagonal shear or a poor grade of lumber had been used.

A considerable number of the floors of concrete bridges in the highway system have required attention. Uneven riding surface resulting from plastic flow of the concrete is the most common cause, which is corrected by placing a leveling course of bituminous macadam surfacing.

In certain localities, concrete bridge floor failure has occurred as a result of frost action, spalling of the surface resulting in unsatisfactory wearing surface and in some instances exposing the reinforcing steel. Maintenance in these instances has been taken care of by use of bituminous macadam wearing surface, properly placed to provide a true riding surface.

The above information was derived from an article by Harvey D. Stover, Bridge Maintenance Engineer, in California Highways and Public Works, the official journal of the Division of Highways.

The Provo Municipal Water System

(Continued from page 15)

The cost of laying 1910 feet of 36-inch pipe amounted to slightly over \$12.00 per linear foot. This does not include the cost of the pipe, which had been manufactured under previous operations. Contract prices were:—

Excavation and backfill...	\$2.50 per cubic yard
Laying 36-inch pipe.....	2.00 per linear foot
Reinforced concrete in place	38.00 per cubic yard

These costs are high, but were not excessive considering the difficulties encountered. The contractor's equipment was adequate for the size of the job, and included a drag line with a boom for handling the heavy pipe, a bulldozer, concrete mixers, 4-inch centrifugal pumps and incidental equipment.

Every precaution was taken, both by the contractor and by the city engineering department, to get a good job done. In spite of all precautions, a test of the line under thirty pounds pressure per square inch showed considerable leakage. No large leaks were found, but some of the pipe was rather porous, and it will be advisable to paint the inside of the pipe with either asphaltic or coal tar paint or with one of the patented coatings, one of which is now being tried out. The pipe is large enough so that men can work inside of it without discomfort, and frequent manholes give access to the interior.

The period of heavy draft is over for this year, and the new line will not be put into service until next summer.

Much work still has to be done before the Provo water system will be satisfactorily completed. In summary, this work consists of the following items:

1. Construction of the new 10,000,000-gallon circular concrete reservoir.
2. Laying 18,000 feet of pipe line from the reservoir to the mouth of Provo canyon.
3. Painting the inside of the 36-inch line.
4. Building an addition to the weir house and installing additional chlorinating equipment.
5. Laying a half-mile of 24-inch pipe in South Fork canyon to complete the connection with the city's springs.

Items 3 and 4 are small jobs which can be done by the present personnel of the city water department. This work will be done immediately, and in fact is already under way.

Items 1 and 5 will have to wait until manpower is available after the war is over; but it is hoped that at least a start can be made in 1945 on Item 2, the 18,000 foot line which will relieve the present bottleneck of the system.

When these five items have been completed, Provo will be in an enviable position, in this land of aridity, and can look forward with complacency, so far as pure cold drinking water is concerned, to those rare years of extreme drought, like 1934, when the rains and the snows fail, and the trout search in vain for deep holes to keep from getting sun-burned. Then it is that a drink of pure cold mountain spring water is really appreciated, and Provo will have it in abundance.

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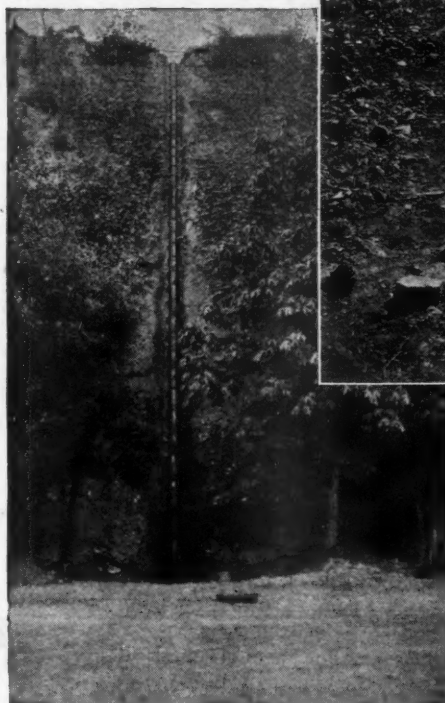
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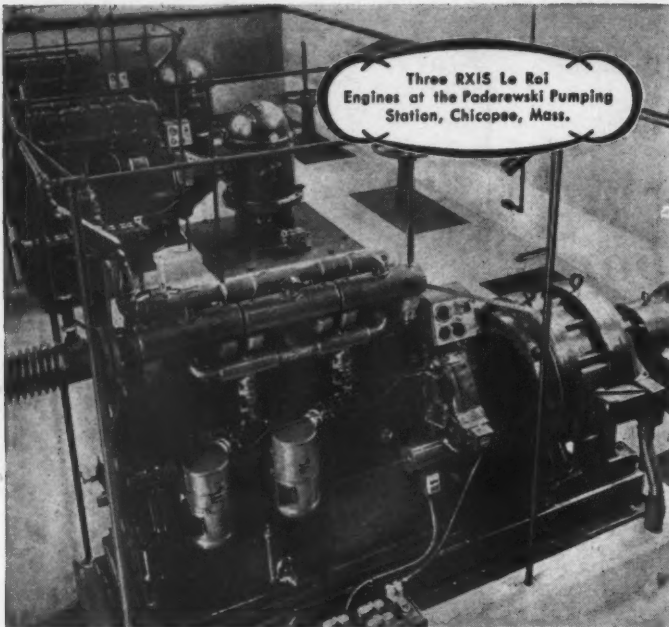
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Danvers, Mass., Prepares for Postwar Work

By ROGER W. ESTY

Superintendent of Water & Sewer Board, Danvers, Mass.

THE Water & Sewer Board of Danvers, Mass., is planning many worthwhile projects for the future, the most outstanding of which is the construction of 28 miles of sewers. About 15 years ago a trunk sewer was constructed across the entire length of the town as part of a joint sewerage project. Three years ago 1800 ft. of sewer was built to serve an industrial plant, and a year later 1.4 miles of sewer was laid into a residential area. In 1944 a committee appointed by the town meeting recommended a 20-year plan for constructing 28 miles of lateral sewers, with interceptors and pumping stations, estimated to cost \$969,000.

Earlier in 1944 the town meeting had appropriated \$6,400 to prepare plans of a complete sewerage system, and these plans are now completed, ready for starting construction of these sewers, which is the number one project of our postwar program.

Additional work contemplated, which can be performed without the necessity of plans, is the construction of house connection from sewers to cellars; renewing or enlarging of old street mains at a cost of about \$180,000; replacing hundreds of old water services, some dating back to 1876; checking, raising or renewing service boxes; overhauling hydrants; checking hydrant and street gate boxes; rebuilding outside meter boxes. Also there are plans for a new garage and repair shop, an office and shop buildings; and the construction of a modern filtration plant.

With such type of projects in view, we can start at any time the one most suited for the existing conditions; and for several years, when a project requiring a lot of men is needed the sewerage system would be the ideal one. In more normal times the buildings and filtration plant could be built.

We believe in preparing now and thinking up every conceivable job, regardless of size; for some day that project may be the means of providing a lot of worthwhile jobs for those coming home from war and out of the war plants.

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From the Gaffney Ledger, Gaffney, S. C.

When you need special information—consult the classified READER'S SERVICE DEPT., pages 71-73

Refacing a Concrete Dam

Replacing the disintegrated face of a concrete dam in a remote mountain location, using high school boys for labor.

By KENNETH TERRY

Foreman, Water Works, Whitehall, N. Y.

WHITEHALL, N. Y., obtains its water supply by gravity from a lake about a mile long by one-fourth mile wide situated about ten miles west of the village, in one of the most picturesque spots in the foothills of the Adirondack mountains. At the outlet is a concrete dam 96 ft. long and 6 ft. high. Some time ago I noticed that the face of the dam was peeling off in places and found that a bar could be driven

several inches into the concrete, but that the concrete beyond that was hard.

Mayor Jerome E. Campbell and Water Commissioner Albert St. Clair, when informed of this condition, authorized me to reface the dam. The job was not a large one, involving less than 100 cu. yd. of concrete, but had several interesting features. One was the labor situation. Our regular force consisted only of myself and two experienced men, and all workers were in the armed forces or in war plants, so I was forced to hire several high school boys who had never done work of that kind before.

The road to the dam is seldom used and is impassable in winter and spring. My first job was to repair the road and bridges in order to get sand, stone, cement, lumber and equipment to the job.

We then removed the loose concrete from the face of the dam, and along the base dug out a footing for the new concrete face, which was made 2½ ft. thick at the bottom and 2 ft. at the top. Then holes were drilled into the concrete spaced 12 in. apart over the entire face, and ½" x 8" lag bolts set in these, with a large washer at the head of each. These bolts were used to hold the forms in place, and later served to bind the new concrete to the old.

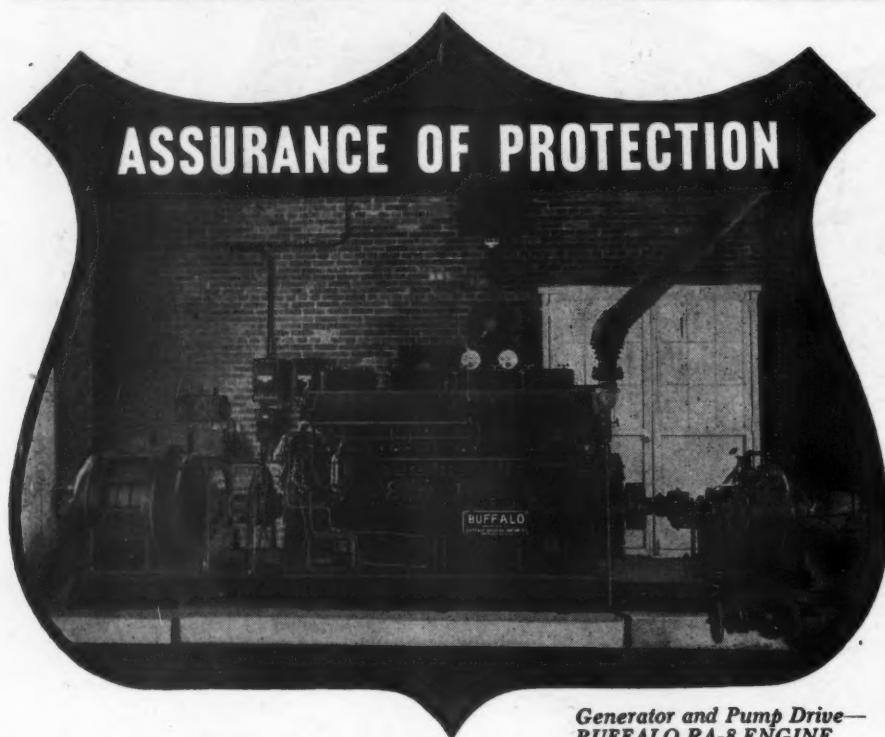
In order to save lumber we made a form only 32 ft. long and used it three times; the three sections of concrete having tongue-and-groove joints, with iron rods across them to tie the three sections together. Form wire was twisted around the lag bolts, passed through the form and fastened on the outside. When the concrete of the first section had set, the wires were cut and the form moved to the other end of the dam; and when this section had been poured, the same form was used for the center section.

The equipment used was a one-bag concrete mixer, a V-8 Ford motor-equipped Schramm air compressor, and a Novo one-cylinder pump. The concrete was mixed one part cement, two parts sand and three parts crushed stone.

This job was completed over a year ago and the concrete shows no cracks and has not pulled away from the dam at any point.

Protecting a Screen From Ice

At a pumping station at Lake Noquochoke for supplying water to Fall River, Mass., a travelling screen was installed at the intake, controlled from a panel in the station and driven by an electric motor. To prevent accumulation on it of frazil or other ice, it has a unit heater controlled by a thermostat and magnetic contactor mounted within the steel housing of the screen, which maintains the temperature at 40° F when the outside temperature falls as low as 20° below zero.



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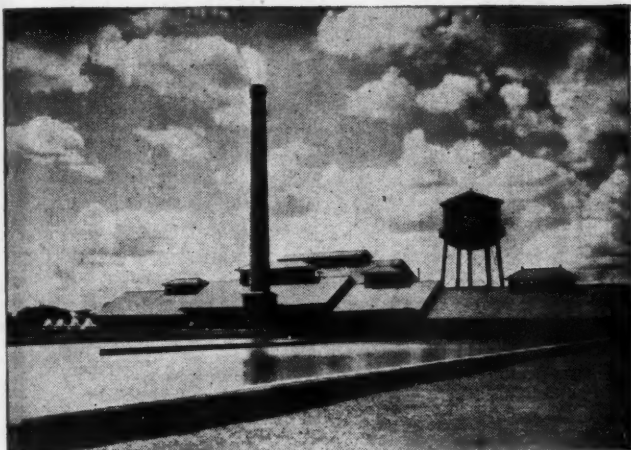
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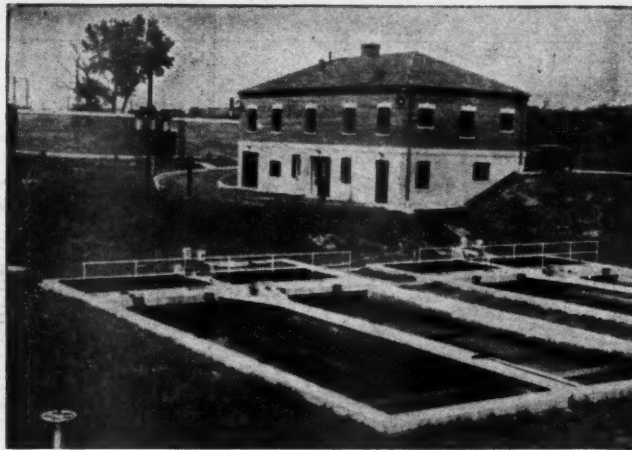


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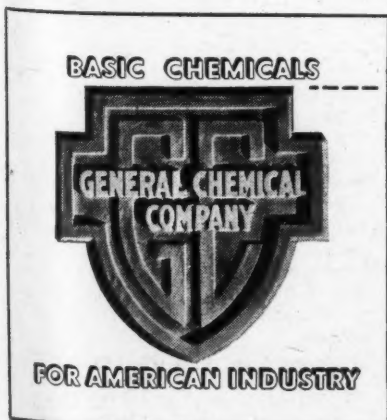
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Units for Expressing Loadings on Filters

The Board of Control of the Federation of Sewage Works Associations has established a sub-committee of the Practice Committee for the purpose of recommending uniform expressions in reporting operation and experimental results. This sub-committee is not concerned with nomenclature, nor with standardization of operation reports. It is concerned solely with the recommendation of specific measuring sticks used in reporting results. At present, loading results are reported in a variety of ways, which makes it difficult to grasp the significance of the work done, unless translated or recalculated into units with which the reader is familiar. For instance: loadings on a trickling filter are reported in volume, per capita, or

by weight per acre, acre-foot, cubic yard, etc. Similarly, a variety of measures are used for digester loadings, aeration tanks, clarifier performance, etc.

To start the work, it seemed best to ask a number of people who have frequent occasion to use various measurements for reporting to express their preference. And since there is perhaps more confusion with respect to filters than any other sewage treatment unit, the committee has prepared lists of (1) methods which have been used for expressing loading on filters, (2) what constitutes loading of a filter, (3) measures used for expressing removals, and (4) methods used to express efficiency.

It desires to learn the preference, under each of these four heads, of engineers, superintendents and others who have occasion to record or interpret sewage treatment data; and will appreciate receiving such information, addressed to the Chairman of the committee, Willem Rudolfs, Towers Bldg., New Brunswick, N. J.

Filters

I. Methods used for expressing loading found in the literature:

- a. Number of people served per acre
- b. Number of people served per acre-foot
- c. Number of people served per cubic yard
- d. Number of people served per square yard
- e. Population equivalent per.....
- f. Million gallon per acre per day
- g. Million gallons per acre-foot per day
- h. Gallons per cubic yard
- i. Gallons per cubic foot
- j. Gallons per square yard
- k. Parts per million B.O.D. and for suspended solids
- l. Pounds B.O.D. and/or suspended solids per acre per day
- m. Pounds B.O.D. and/or suspended solids per acre-foot per day
- n. Pounds B.O.D. and/or suspended solids per cubic yard of stone
- o. Pounds B.O.D. and/or suspended solids per cubic foot of stone

II. What constitutes loading of a filter?

- a. On basis of raw sewage
- b. On basis of settled sewage
- c. If recirculation is practiced, should the load contributed from this source be included?

III. Measures used for expressing removals:

- a. Pounds B.O.D. and/or suspended solids removed per acre per day
- b. Pounds B.O.D. and/or suspended solids removed per acre-foot
- c. Pounds B.O.D. and/or suspended solids removed per cubic yard
- d. Pounds B.O.D. and/or suspended solids removed per cubic yard
- e. P.p.m. B.O.D. and/or suspended solids

IV. Methods used to express efficiency:

- a. Percentage reduction calculated from p.p.m. removal of B.O.D. and/or suspended solids by filter alone
- b. Percentage reduction calculated from p.p.m. removal of B.O.D. and/or suspended solids by filter and secondary settling tank
- c. Percentage reduction calculated from the pounds B.O.D. and/or suspended solids removed by the filter alone
- d. Percentage reduction calculated from the pounds B.O.D. and/or suspended solids removed by the filter and secondary settling tank

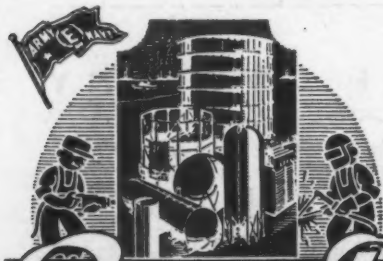
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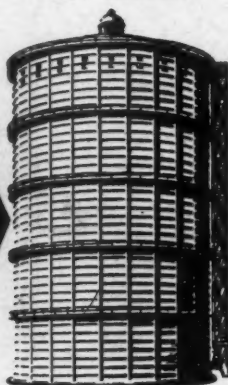


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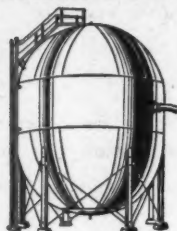
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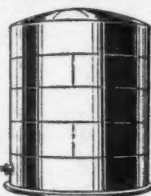
GAS HOLDERS



HI-PRESSURE TANKS



STORAGE TANKS



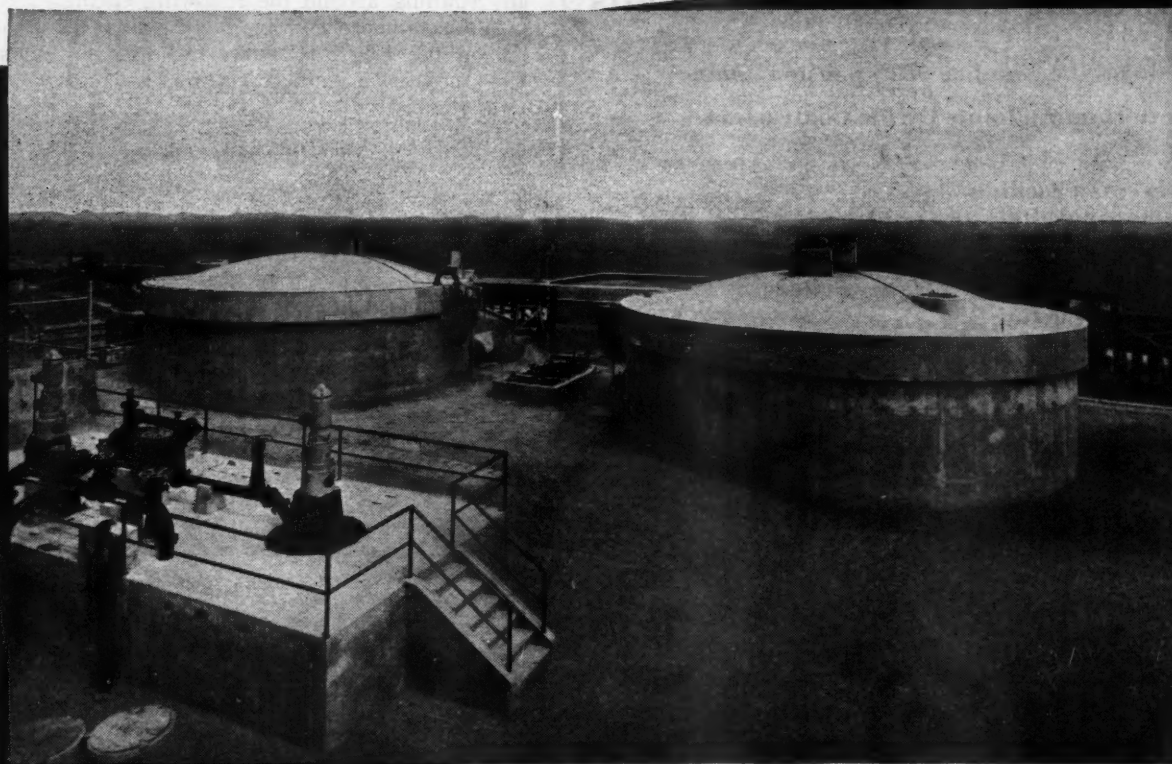
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When you need special information—consult the classified READER'S SERVICE DEPT., pages 71-73



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Twenty-two

Reasons Why *FLEX-PLANE* Dummy Joints are Necessary in Modern Concrete Pavements

- Reduces the Number of Expansion Joints
- More Dummy Joints Divide Contraction Openings
- Prevents Cracking
- Retards Creeping
- Controls Warping
- Reduces Curling
- Relieves Stress
- Lessens Bumps
- Minimizes Pumping
- Minimizes Panning
- Lessens Deterioration
- Lowest Cost
- Limits Maintenance Cost
- Anchored in Place — Is Permanent
- No Extrusion
- Localizes Expansion and Contraction
- Assists in Normalizing the Slabs
- Ribbon Joint is Continuous in Length
- Prevents Infiltration of Water
- Increases Strength of Slabs
- Produces Homogenous Structure
- Provides Expansion Relief for the Hot Upper Part of the Slab



FLEX-PLANE joint installing machines eliminate messy hand methods. Install all types of joints . . . ribbon, poured, premoulded, etc., with or without VIBRATION.

- Ask for Equipment Specifications •

FLEXIBLE ROAD JOINT MACHINE CO. WARREN, OHIO
U. S. A.

When writing, we will appreciate your mentioning PUBLIC WORKS

At Last, a "Calfdozer"

In the April, 1941, issue of PUBLIC WORKS we published a photograph of what was called a "cow-dozer." Jack How, of the Caterpillar Tractor Co., described the machine for us, ending with: "So far we've no record of calf-dozers. But we'll keep you posted." This last was in reply to our request that we receive a photograph of a calf-dozer should there be any running around the following spring.

We have heard nothing further from this cow-dozer, but in the English "Surveyor" for November 24th, 1944, appears a photograph of a "Calfdozer," built by



The English "Calfdozer"

Averling-Barford, Ltd., and described as a "small bulldozer which includes many novel features for the leveling and clearing of sites, back-filling excavations and trenches, and the trimming of stock piles, displacing at a conservative estimate some six to ten men with their picks, shovels and barrows. It can be operated easily by unskilled labor, the travelling and the maneuvering of the machine being controlled by two handles conveniently placed on either side of the operator's seat. These two handles are connected to two independent quick reverse clutches driving each track, permitting either track to be instantly engaged or reversed for extreme maneuverability in confined spaces."

Stone From Jail to Culverts

The highway department of Brown County, Illinois, wanted to build a number of permanent culverts. Ordinarily these would be built of concrete; but an abandoned jail built of blocks of soft sandstone gave them an idea, and now the jail has been transformed into six stone culverts. The County Superintendent of Highways, Guy D. Seckman, told us about it in a recent letter, in which he said:

The jail was built from soft sandstone blocks, dressed out 22" wide and 22" thick, and of different lengths, some of them better than 6 ft. There was stone enough for six culverts, which we built the same sizes as we would if we had used reinforced concrete.

For the base we placed from 6 to 10 inches of small rock; then we poured into this a thin mix (1:4) of cement grout. After this had set we put up the side walls two feet high and two feet apart. For the top we used what we called "cap rock" which, for a 2 ft. x 2 ft. culvert, were 4 ft. long, 10" or 12" thick, and any width. These culverts were easily built and neat appearing.

as Public Tax Saver No. 1?

THE public has an important stake in the economical operation of water supply, gas distribution and sewerage systems, as reflected in taxes, assessments or rates. By avoided *replacements* of mains, which would have been necessary with shorter-lived pipe, Cast Iron Pipe has saved the public millions of dollars in taxes. Many years after the bonds issued to pay for them have been retired and forgotten, Cast Iron mains are still in service.

The principal reasons why Cast Iron Pipe has earned its reputation as Public Tax Saver No. 1 are as follows:

A Century or more of useful life as a structure. The *proved* useful life of Cast Iron Pipe is at least double the *estimated* life of other pipe materials used for underground mains.

A Century or more of high capacity as a carrier. Cast Iron Pipe (except in certain locations) assures 100 years of useful life and 100 years of high carrying capacity. In those locations where tuberculating waters are a problem, lined Cast Iron Pipe insures continued high carrying capacity for the life of the pipe.

Low Maintenance Cost . . . far below that of any other pressure pipe material which has been in use long enough for the recording of conclusive data.

Address inquiries to Cast Iron Pipe Research Ass'n. Thos. F. Wolfe, Research Engineer, Peoples Gas Bldg., Chicago 3, Ill.

THE 10 REQUIREMENTS FOR UNDERGROUND MAINS

LONG LIFE: The useful life of cast iron pipe is 100 years minimum.

FLOW CAPACITY: Under normal conditions, the flow capacity of cast iron pipe remains practically unimpaired for centuries. For the limited areas where active water is encountered, cement-lined cast iron pipe is available. Under such conditions, no other material offers the combined long life and sustained flow capacity of lined cast iron pipe.

TIGHT JOINTS: For ordinary pressures, cast iron bell-and-spigot pipe—for high pressures, cast iron mechanical joint pipe—are known to be leak-proof.

TENSILE STRENGTH: Standard cast iron pipe ranges from 23,000 to 30,000 pounds per square inch.

BEAM STRENGTH: Standard six-inch cast iron pipe bears up under a load of 17,500 pounds and deflects approximately 1½ inches before breaking.

TOUGHNESS: Under hydrostatic pressure and the impact of a 50 lb. hammer, ordinary cast iron pipe does not crack until the hammer is dropped four feet (beginning at one foot with one-foot increases).

INTERNAL PRESSURE: Standard six-inch cast iron pipe withstands more than 2,500 pounds pressure per square inch.

EXTERNAL PRESSURE: A 12-inch section of standard six-inch cast iron pipe withstands a crushing weight of 14,000 pounds.

IMPERVIOUSNESS: The walls of cast iron pipe are impervious to leakage, seepage or sweating of water, gas or chemicals under internal pressure tests.

TAPPING: Cast iron pipe can be tapped cleanly with strong, tough threads, losing little in structural strength.

Other pipe materials meet some of these requirements but only cast iron pipe meets them all.

CAST IRON PIPE

SERVES FOR CENTURIES

When you need special information—consult the classified READER'S SERVICE DEPT., pages 71-73

Traffic Signals and City Sizes

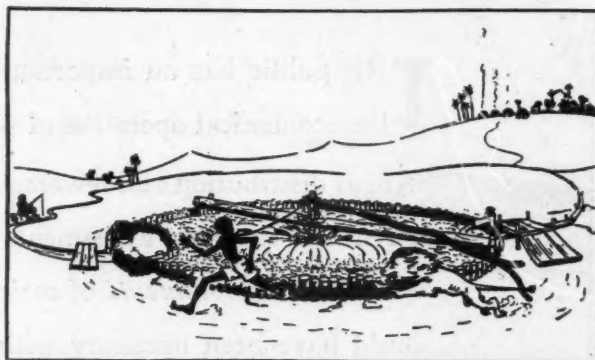
A survey of over 100 cities made by the American Automobile Association and summarized in their Research Report No. 26, indicates that there is approximately one signalized intersection for each 2,000 population. Differences between population groups are not significant. Details are given in the accompanying table.

There is a wide variation among cities in each population group. For example, among the cities of 100,000 to 500,000 population one city had a signalized intersection for each 3,800 population, while at the other extreme another city had a signalized intersection for each 1,140 population. It is doubtful if the traffic conditions in the two cities warranted this wide variation in the number of signalized intersections. This wide variation prevalent among cities of all population classes indicates the need for more data to establish warrants for traffic signals.

Cities that depart radically from the average of 2,000 persons per signalized intersection might well give careful thought to the subject to determine

whether their deviation from the normal is justified.

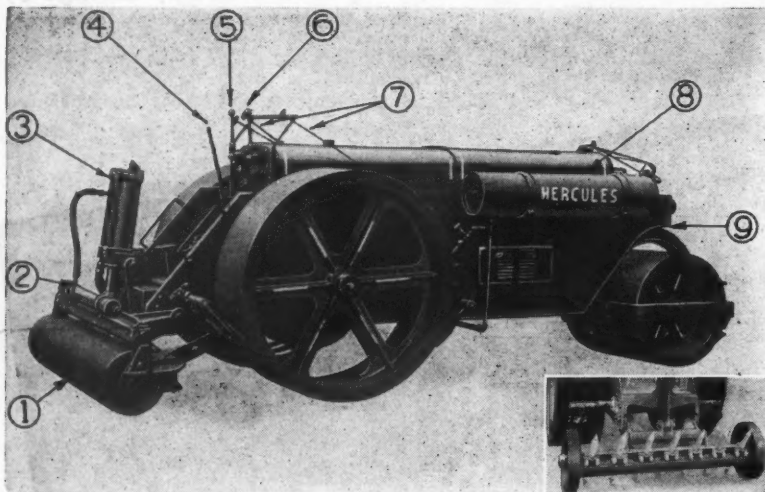
If it is assumed that the cities reporting in this study are typical of the cities in each population class then there are approximately 36,000 signalized intersections in the United States.



From an advertisement of the "Simplex" surface aeration process in the English paper "The Surveyor." In spite of the blitzes, the Englishman has his humor, at least, "as usual."

Persons per Signalized Intersection

Population Group:	Cities Reporting		Total Signalized Intersections	Mean	Persons per Signalized Intersection	
	No.	Total Pop.			Minimum	Maximum
Under 10,000	33	236,105	131	1802	617	
10,000—25,000	24	382,314	202	1893	583	
25,000—50,000	17	612,044	374	1636	630	17,600
50,000—100,000	14	989,699	433	2286	1380	6,600
100,000—500,000	17	3,846,918	2173	1770	1140	3,800
Over 500,000	3	2,293,007	1043	2198	1420	4,900
Total	108	8,360,087	4356	1919		



HERCULES ROLLER WITH *IRONEROLL* ATTACHMENT

- 6. Operating Lever for steering
- 7. Sprinkler Controls
- 8. Sprinkler Tanks (2)

- 9. Gyroscopic Yoke reduces weaving
- 10. (Insert) Heavy Duty Scarifier — interchangeable with *IRONEROLL*

When equipped with the *IRONEROLL* the 3-wheel roller becomes a highly improved tandem unit that smoothes to hump-free perfection.

With the *IRONEROLLER* there is less rolling—less expense.

Built by HERCULES ROLLER COMPANY Bucyrus, Ohio

TO KEEP ROADS ICE-FREE...
YOU
"PASS the SALT"



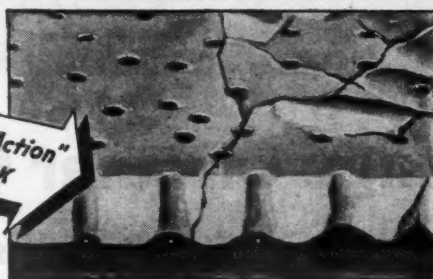
...and make sure it's
STERLING
"Auger-Action" ROCK SALT!

KEEPING ROADS OPEN, drivable and *safe* on the coldest days and nights... calls for efficiency *plus* in removing snow and ice. And that's just where Sterling "Auger-Action" Rock Salt comes in!

This melting agent literally bores through crusted snow or treacherous ice. By breaking up the mass it makes ready removal easy. Or applied when a storm is beginning, it keeps snow from packing or bonding to road surfaces.

Many days of freezing weather remain. So "pass the salt"—Sterling "Auger-Action" Rock Salt, of course!—and save valuable time, conserve war-

vital manpower... in keeping roads open in the bitterest weather. Its remarkable speed and efficiency make short work of the toughest winter hazards.



**We Are Always Ready to Help
Solve Your Ice Control Problems**

Economy keynotes the Sterling method of snow removal! Engineers report one-third to one-half savings... communities report budgets sharply pared. Write today for free bulletin crammed with facts on streamlined ice-and-snow-removal. Free consultation with an International Field Engineer upon request. International Salt Company, Inc., Dept. PW-2, Scranton, Pa.

Sterling "Auger-Action" ROCK SALT
INTERNATIONAL SALT COMPANY, INC. • Scranton, Pa.

Providing Pure Water for the Army

Most military installations have their individual supplies, selected by the Medical Dept. and built by the Corps of Engineers. These and the few city supplies are all chlorinated. How operation is controlled.

RESPONSIBILITY for Army water supplies is shared by the Medical Department and the Corps of Engineers—the former for all factors that affect health, and the latter for engineering design, construc-

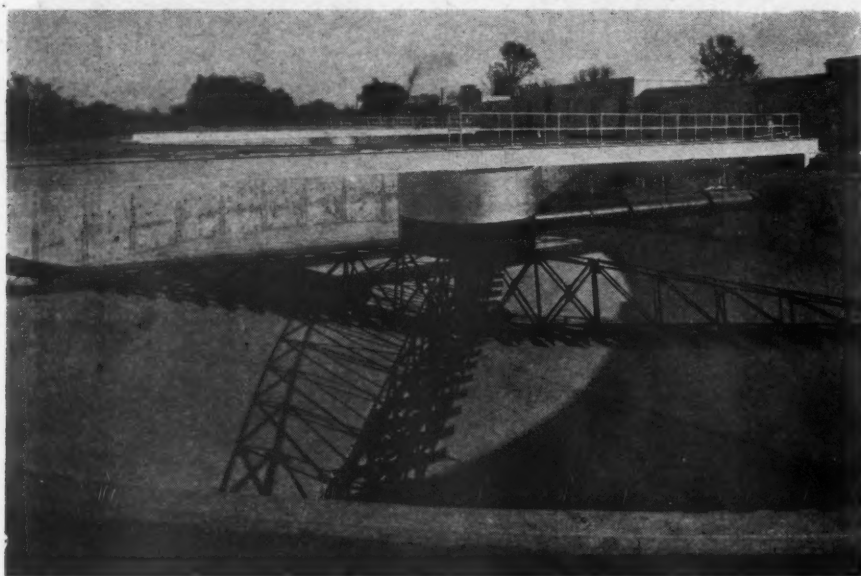
tion and actual operation of the plant. In the continuing cooperation between these two components of the Army, each has an important function. To illustrate: The Medical Department, acting through the Sanitary Engineering Division, Preventive Medicine Service, Office of The Surgeon General, established, early in the emergency, standards of design covering those factors that affect the sanitary quality of the water. These design factors were promptly incorporated in the Engineering Manual of the Corps of Engineers.

The proposed source of supply for a post is normally referred to the Medical Department for approval. Construction of the water system is solely a Corps of Engineers function. Operation also is an Engineer responsibility with the Medical Department exercising sanitary supervision to insure the production of safe water. This sanitary supervision is normally provided through the Sanitary Corps engineers in service command headquarters and in the various posts, camps and stations.

The magnitude of the problem in the United States alone can be judged by the number of military installations, for each of which a water supply had to be provided. While it was possible in some cases to purchase water from nearby municipal systems, in the great majority of cases it was necessary to find a source of supply, develop it and build the necessary water supply system and treatment plant. Even in those cases where water could be purchased, additional construction was often required; and additional treatment of purchased water is normally required to provide an added margin of safety for the military personnel.

The fact that added treatment is considered necessary for nearly all purchased supplies should not be construed to indicate that nearly all municipal supplies are of an inferior quality. That is not the case; but sound reasons exist for the Army's policy. One of the important ones is that nearly every municipal water plant selling water to the Army is operating at its maximum possible rate. Few plants have such surplus

(Continued on page 48)



Hardinge Circular Clarifiers

For rapid removal of the settled solids

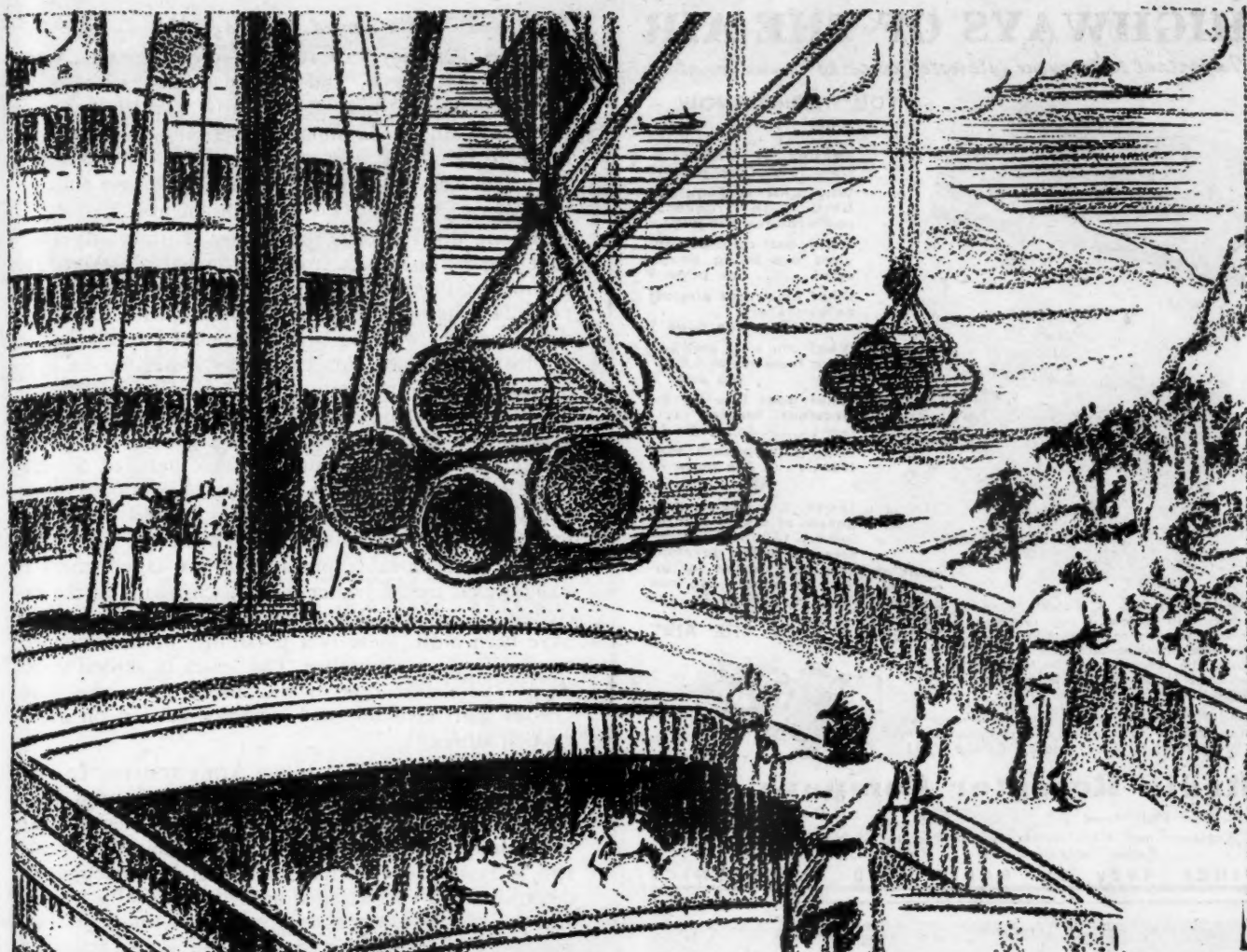
Built in sizes from 6 ft. to 150 ft. diam. for primary and final clarification. Primary clarifiers are equipped with efficient skimmers for the removal of all floating material. The unit drive mechanism consists of a worm gear mounted on ball bearings in an oil-tight housing. The drive motor is mounted on the housing and is completely assembled at the factory.

Bulletin 35-B

HARDINGE

COMPANY, INCORPORATED, YORK, PENNA.

NEW YORK CHICAGO SAN FRANCISCO TORONTO



AQUA NUCAR ASSURES PALATABLE WATER ON EVERY FIGHTING FRONT!

From the South Pacific to Mainville, U.S.A., Aqua Nuchar Activated Carbon makes water clear, palatable . . . pleasing to the taste.

A little Aqua Nuchar goes a long way, because Aqua Nuchar purifies by adsorption. Each particle of Aqua Nuchar Activated Carbon is riddled with tiny pockets that trap algae and other taste-forming bodies, thus giving your community palatable water.

Unpalatable water is a particular threat at this time of year with winter's thaws and high water. A sudden change in temperature can mean an equally rapid transition in your water supply. Consequently, waterworks engineers all over the country should keep a supply of Aqua Nuchar Activated Carbon at hand to cope with unexpected situations.

For crystal-clear water, give your community the same purification protection that Uncle Sam gives G. I. Joe. Although Aqua Nuchar is serving on fronts all over the world, there is an ample supply in this country for your community.

At strategic points throughout the United States you'll find stocks of Aqua Nuchar—the activated carbon that does a big job of purification . . . by adsorption.

BLUEPRINT NOW!

But above all, remember there is a war yet to be won.
Maintain equipment to assure operation at 100% efficiency.



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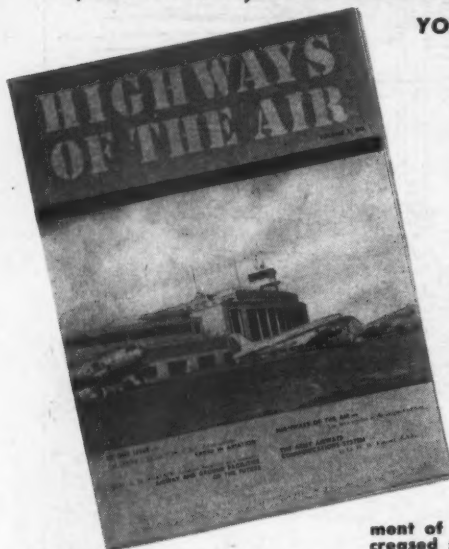
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When you need special information—consult the classified READER'S SERVICE DEPT., pages 71-73

HIGHWAYS OF THE AIR

Important to everyone interested in airports and aviation



This issue is No. 1, Volume 1 — others will follow if you request them. Contents are authoritative—but non-technical—designed to inform the layman on a subject which is becoming of increasing importance.

Send for your copy on your letterhead—we are glad to send it as our contribution to a greater Air-America. Address Desk P.W.-11.

YOU SHOULD KNOW —

What is the "bottle-neck" in post-war expansion of civil aviation . . . See page 8

Why CAA is installing Ultra High Frequency radio ranges. See page 8

What anti-collision devices are being developed . . . See page 9

What electronic aircraft detectors are. See page 9

What can civil aviation learn from the A.A.C.S. See page 2

What goes into an instrument landing system . . . See page 11

What is approach control . . . See page 11

These questions and dozens of others of vital import to all those interested in the development of radio in aviation for increased safety of human life and property are discussed in the pages of "HIGHWAYS OF THE AIR"



Radio Receptor Company, Inc.

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Engineers and Manufacturers of Airway and Airport Radio Equipment
Radio Navigation Aids • Airport Traffic Controls

SINCE 1922 IN RADIO AND ELECTRONICS



CUT MAINTENANCE COSTS 75%

Concrete slab maintenance costs can be reduced as much as 75% by the Koehring Mud-Jack Method. The Mud-Jack raises sunken concrete walks, curbs and gutters, driveways, streets, and airport runways eliminating reconstruction costs. Write for the new Mud-Jack Bulletin which is both illustrative and descriptive.



KOEHRING COMPANY

Milwaukee, Wisconsin

MUD-JACK METHOD

When writing, we will appreciate your mentioning PUBLIC WORKS

(Continued from page 42)

capacity that they can readily supply to the Army the water it needs, and can also take care of its own population generally greatly swollen by war conditions. Such maximum-rate operation is especially liable to bring out any sanitary defects that exist in the water works system, and may create new ones by breakdown of overloaded key equipment.

Among other defects that Army sanitary engineers have learned to expect from overloaded plants are the following: Pretreatment is inadequate to permit full-rate, 24-hour operation of the filters, with the result that excessive washing and occasional periods out of service is necessary for the filters, resulting in high operating rates per minute. Clear-well and storage facilities are often not adequate to meet peak-load demands, with the result that negative pressures—always dangerous—exist frequently in some parts of the distribution system. Because the reserve of stored water is not sufficient to meet fire protection needs, auxiliary fire fighting supplies are made available and, even though all reasonable precautions are taken, there is danger that unsafe water may reach mains in the excitement of a fire. Where new large industrial plants have been built, there is a possibility of cross-connections with unsafe supplies. The losses in skilled water supply personnel due to war needs have also been serious and have imposed a heavy burden on many municipalities.

Defects may also exist in the Army systems. In fact, the haste with which many of our Army camps were built did result in many sanitary defects. Recognizing this danger, the Army instituted more than three years ago a system of routine and special inspections to determine and correct such hazards. Specially trained and selected Sanitary Corps engineers, most of them with long experience in state health work, acting in close cooperation with the Repairs and Utilities Branch, Corps of Engineers, are utilized for these inspections. Most defects are remedied on the spot by the post engineer and the sanitary engineer; a few, because of the cost, must be handled in service command headquarters; and a very few reach Washington for necessary action.

It is due to such factors, and to others of perhaps less moment, that the chlorination of all Army water supplies is required. The amount of chlorine residual required by the Army—0.4 ppm in the commonly used parts of the distribution system—has not met with unanimous approval, generally being considered rather high; but it appears to have met Army needs, to have made water-quality-conscious a good many Army officers, and to have resulted in a safe and generally satisfactory water. The cost has been trifling, and in relatively few places has there been real difficulty in meeting the requirements. On the credit side is the fact that not a single epidemic of intestinal disease has been traced to an Army water supply in this country. The same can not be said of purchased supplies not retreated by the Army.

As already stated, operation of water plants is a function of the Corps of Engineers; yet because improper or unskilled operation may nullify all other precautions to safeguard the water, operation is of great interest to the Medical Department as a health factor. Fortunately, through close cooperation and mutual assistance, an effective medico-engineer program has been established. Through this program, high standards were established for operators, and a training program for them was instituted. In most cases,

NOT HEROIC LIKE THIS LEGENDARY LAD...

BUT... THIS FINER JOINTING COMPOUND

STOPS LEAKS

BY PREVENTING THEM

Of course you've read of the heroic Dutch lad who held the leak in the dyke with his arm until help came to prevent inundation.

MOST LEAKS in water mains result from vibration. Such leaks seldom threaten catastrophic inundation, but they do mean a loss of precious water and expensive excavation and repairs.

Joints made with lead or similar materials continue to leak until excavated and repaired. *Tegul-MINERALEAD* joints however, usually have ample strength and plasticity to withstand even severe vibration such as occurs in lines on bridges or under railroad tracks. In the rare event that a small leak should develop, the sulphur element in *this* compound goes to work at once and the leakage seals automatically. No excavating or repairs are necessary.

This is one of a number of ways in which *Tegul-MINERALEAD* helps cut down line maintenance costs. Its economies extend also to laying, for that inevitable initial leakage usually ceases much sooner with this sulphur base compound.

Using *Tegul-MINERALEAD* you can proceed at once with back-filling and consequent clearing up of traffic hazards that come from open trenches.

When you plan your next installation of Bell & Spigot Main, plan also to save time, trouble and laying and maintenance cost by using

OTHER IMPORTANT ADVANTAGES OF



The ingot form is easily handled, shipped, stored and worked • Unaffected by moisture, it needs no protection from storm or flood when stored in the open • No possible change of physical composition can result from travel jolting • Requires no skilled labor, caulking or deep bell holes.



Write for literature about this better jointing compound in 10 lb. ingot form.

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P. O. Box 3084

the Repairs and Utilities Branch engineer officers felt the same responsibility for, and interest in, maintaining a high standard of water quality as did the Sanitary Corps engineer officers. Because of this, close cooperation was normal. For instance, if the operator was inexperienced, care was taken to station a skilled Sanitary Corps engineer at the post in order to provide supervision.

In order to maintain a constant check on the quality of the water and on plant operation, a comprehensive sampling and testing program has been adopted. Medical Department laboratories are normally used to make these tests. During the period from July 1, 1943, to June 30, 1944, 243,000 samples were examined, of which 2.1% were non-potable. During the three months

ending September 30, 1944, more than 50,000 samples were tested of which 1.8% were non-potable.

The above data refer primarily to water supplies serving fixed installations in the continental United States. In general, the same principles and standards are applied, so far as possible, to overseas water supplies for permanent-type installations. Less attention is paid to the presence of iron or sulphur, if these do not affect the efficiency of chlorination; and to color. Sometimes a relatively high chlorine residual is maintained. The end result has, however, been very satisfactory, except in a few instances. In one theater having eight important fixed stations, there have been no non-potable samples reported for nearly three months; in two other overseas commands, almost equally good

results are being obtained; and these three are not greatly superior to many others. Provision of satisfactory water for troops in the field is a more difficult problem, as taste, odor, color and turbidity are often impossible to remove with available equipment, but the water is generally safe.

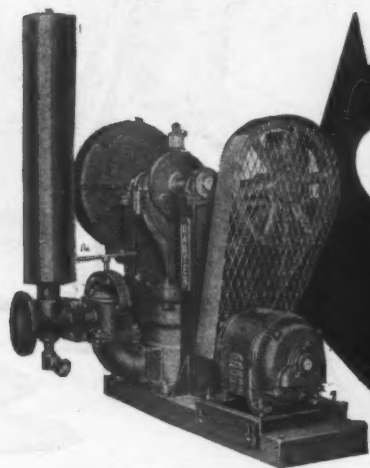
Figure 4 shows results to June, 1944, from an overseas theater. One supply is from shallow wells; another combines purchase of a local supply with a deep well installation; another combines distillation and a rain-water catchment area; all others are from deep wells. At one of the deep well installations, treatment with lime and aeration, followed by settling, was necessary to reduce the iron (normally 4 to 5 p.p.m.) and CO₂ content. Aside from this, chlorination is the only treatment provided at any of the posts; but all water used is chlorinated by the Army, irrespective of its source, as a safety precaution. Since Figure 4 was prepared, reports have been received covering the period July-October inclusive; there were several bad samples in July, all from one well; none in August or September; and one in October.

New Orleans Expands Collection Service

Steps to purchase ten refuse collection trucks and an additional fifteen dump trucks were taken recently by New Orleans Deputy Commissioner of Public Property Michael J. Kelly.

The purchase involves the expenditure of \$125,000 for this modern equipment, and involves the securing of the necessary WPB approval. The extension of garbage collection service to housing developments at war plants made the proposed expansion necessary.

A new street cleaning machine operating with steam and chemicals, developed by Messrs. Kelly and Schneider of the Department of Public Property will be inaugurated in the clean-up campaign.



CARTER SLUDGE PUMPS

EXCLUSIVE FEATURES

- Flanged construction throughout pump.
- Renewable valve seats.
- Babbitt lined eccentrics.
- Flywheel effect on main shaft.
- Elimination of pump pound by automatically maintained air cushion in pump cylinder.
- Drive and reduction gearing which distribute shock loads and reduce wear.

***DEPENDABLE**

***MODERN**

***RUGGED**

FOR over forty years, the RALPH B. CARTER COMPANY has been building specialized pumping equipment for handling sludge and liquids containing foreign material. Constant improvement by our engineers assures you the finest of equipment.

CARTER pioneered the field being the first to build a pump exclusively for this sludge service; the first to use ball valve construction; the first to furnish renewable valve seats as standard equipment; the first to use case hardened herringbone gear reduction on ball bearing supports and

the first to provide a quickly accessible valve chamber.

Constant research and development has made and will make the CARTER sludge pump a sound investment for your plant.



• Write for Bulletin 816.

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When writing, we will appreciate your mentioning PUBLIC WORKS

Legislation to Empower Governors to Adjust Speed Limits

Legislation designed to bring the power of state enforcement agencies in support of highway speed limits recommended by the Federal Government "in furtherance of the prosecution of the war" through vehicle conservation is being suggested to state legislators by the Council of State Governments.

The proposed uniform bill would give the state governors authority to formulate speed regulations "in accordance with such rules and regulations as may be prescribed or such policies as may be established by duly authorized federal authority."

Vehicles used in public health or safety work would be exempted subject to local speed control.

In recommending the legislation the Council states that "enforcement of speed limits is primarily a State function and it is only on a State and local basis that enforcement can be effected."

Vacuum Filtration at the Minneapolis-St. Paul Plant

(Continued from page 26)

In cleaning the filters and cloths, 18° Be. muriatic acid is used, with aniline oil as a corrosion inhibitor. In 1943, with a conditioning dosage of 2.6% CaO and 1.3% FeCl₃, analyses of the binding materials in the filter cloths showed 40.6% lime, 45.2% grease, 11.5% iron and 2.7% sand or grit. In 1941, when using 3.8% CaO and 1.4% FeCl₃, 60.7% of the binding material was lime, 24.5% grease, 7.2% iron and 7.6% sand or grit. With the reduction in lime as the predominant constituent of the binding material, the importance of grease has increased proportionately and becomes a very significant factor.

In the past some difficulty has been encountered because of the buildup of calcium carbonate in the sludge distribution lines from the conditioning tanks to the vacuum filters. This carbonate deposit has also occurred in the vacuum lines on the individual filters and on the woodwork and screens forming the drum of the filter. In April of 1943 a device was installed to feed hexametaphosphate continuously to the sludge along with the lime and ferric chloride as a means of attempting to eliminate the build-up of lime. This experiment was continued for two months with negative results, possibly due to its absorption by the organic material in the sludge. Upon the failure of this effort to control the build-up of carbonate deposits, the next effort in this direction was the control of the pH nearer the stability point, so as to eliminate carbonate deposits on the one hand or corrosion of the metal parts on the other hand. As shown in the following tabulation, the pH of the filtrate has been gradually reduced from 11.7 in 1938 to 8.9 for the last half of the year 1943.

	Filtrate pH	% FeCl ₃	% CaO
1938 Average	11.7	3.17	10.30
1939 Average	11.6	2.10	5.68
1940 Average	10.5	1.92	4.76
1941 Average	10.0	1.53	3.77
1942 Average	10.4	1.20	3.44
1943 (Jan.-June)	10.2	1.07	2.98
1943 (July-Dec.)	8.9	1.19	3.16

An inspection of the piping after six months of operation with lower pH values revealed considerably less build-up than had formerly occurred. This statement applies as well to the accumulation on the screens and woodwork of the filter. However, with the reduction of the lime build-up on the filters another

JAEGER "Sure Prime" — Pumps that Exceed Their Promises



Sales — Rentals — Service in Over 100 Cities

THE JAEGER MACHINE CO., 400 Dublin Ave., Columbus, Ohio

CONTRACTORS' PUMPS, MIXERS, HOISTS, PAYING EQUIPMENT

WHY FLINK Ice Control IS 6 TIMES FASTER

Spreads
at 12
to 20
miles
per hour

Spreads at 12 to 20 miles per hour. Starts spreading without stopping truck. Driver speeds rapidly toward icy streets and intersections, throws Flink spreader clutch in and out of operation at will. Entirely controlled from cab.

Flink one man material spreader, Model WD3, equipped with Flink clutch control, is today's best answer to the danger of sudden freezes and the shortage of men and equipment. One man driving a Flink equipped truck can rapidly bring under control many miles of icy streets. Intermittent spreading has been made possible without stopping truck until it is emptied.

Self-feeding. No helper to rest up or warm up. Saves men and expense. Fits all dump trucks. Attaches like original end gate. Spreads forward or backward, full or half width of streets, thick or thin, all materials up to 1".

Does not limit use of truck. Truck can be dumped as with original end gate, or spreader can be replaced by original end gate in 5 minutes. When not spreading material use dump truck for any other purpose. Write for complete literature.

Flink Spreaders are used for road, street, and highway work, and for spreading agricultural limestone.

The FLINK COMPANY

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problem presented itself; namely the accumulation of a gelatinous coating on the filter drums and screens, efforts toward the control of which are now under way.

The following summary table shows the filtration rates on the vacuum filters since operation started:

	Filtration Rate Lbs. Per Sq. Ft. Per Hour	Dry Solids Basis Lbs. Per Sq. Ft. of Filtering Area Used
1943	3.47	0.29
1942	3.40	0.29
1941	3.82
1940	4.29
1939	4.73
1938	5.50

In the first column filtration rates on the usual basis of pounds per square foot per hour are shown. These have been consistently reduced by using more filters and reducing the chemical dosage to the pound where in 1942 and 1943 the lowest filtration rate possible for the present number of filters was employed. Economic studies indicate the desirability of reducing this rate even further by the addition of more filters. Realizing the inherent accuracy of the yard-stick for filtration generally employed, namely pounds per square foot per hour, counters were installed on all filters in the latter part of 1941, so as to permit the determination of the actual area of filtering service used in any given period of time. While the conventional basis of expressing filtration rates is still being calculated, it has been found that the new yardstick, based upon the pounds per square foot of filtering area actually used, measures more accurately the work performed by filters, since the conventional basis does not take into account several factors effecting filtration, more particularly the speed of rotation of the drum, and therefore the filtering area in a given period of time.

The chief engineer and superintendent of the Sanitary District is George J. Schroepfer. Benjamin M. Storey, William M. Trulander, Van H. Parker and Glenn Stroessenreuther were the plant operators.

Kansas State Highway Patrol Cars Find 2-Way Radio Tests Successful

Kansas State Highway Patrol cars have completed successful tests of two-way radio and Col. Will Zurbucken, patrol superintendent, believes "It's going to be the greatest thing we've done in this state for a long time."

Radio transmitting and receiving sets are now in operation in two cars of the patrol and will be installed in 34 more, including Highway Commission cars, within the coming two months.

Latest equipment installed is a sixteen-foot antenna on top of the 300-foot State Capitol dome. Equipped to eliminate electrical interference, the antenna picks up radio signals and a special line carries them to the headquarters transmitting station at the state highway shops.

Equipment of the latest design is being installed at an initial cost of \$14,305, the patrol superintendent said, with \$9,825 of the amount coming from patrol funds and the rest from highway commission reserves.

Highway Officials Study Vehicle Regulations

The American Association of State Highway Officials currently is conducting a study of its motor vehicle sizes and weights recommendations and the results will be presented for adoption by the states as minimum limitations for commercial motor vehicles operating in interstate commerce.

Stripe Streets for GREATER SAFETY!



M-B Marker putting down single line at street intersection.



Rear view of M-B hand-propelled Marker equipped for double line striping.

It's much easier to control city traffic if streets are properly striped. This handy M-B Marker simplifies the striping job. It handles ALL types of marking; Center-lines, parking areas, cross walks, safety zones, etc. Can also mark athletic fields, airports, tennis courts, playgrounds, etc., and is quickly convertible to an all-purpose paint sprayer. Write for descriptive bulletin.

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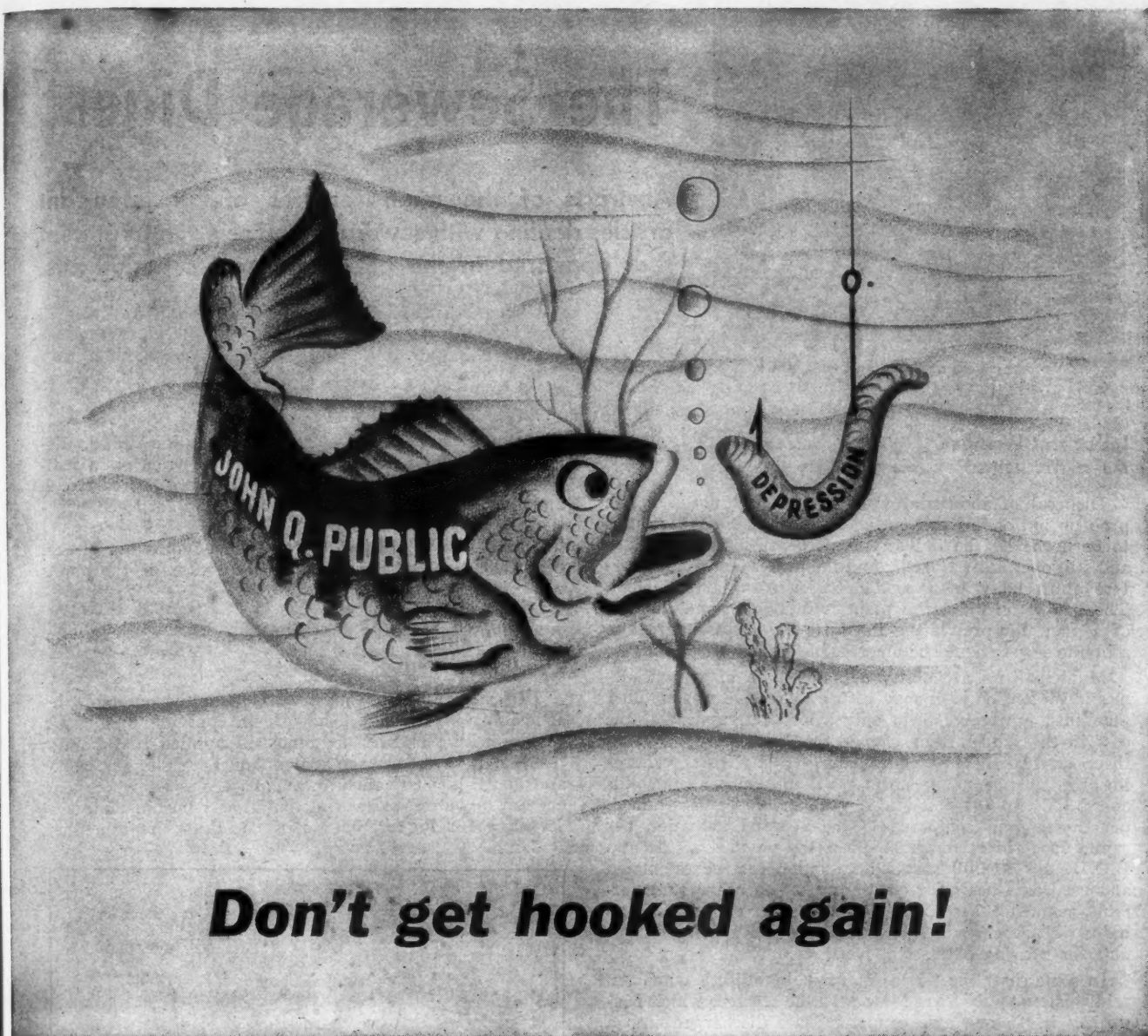
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It's the best way to protect yourself against a depression if one should occur, *and* the best way to prepare yourself for tomorrow's opportunities if times are good.

The smart thing today is to save, not splurge. Don't get hooked again!

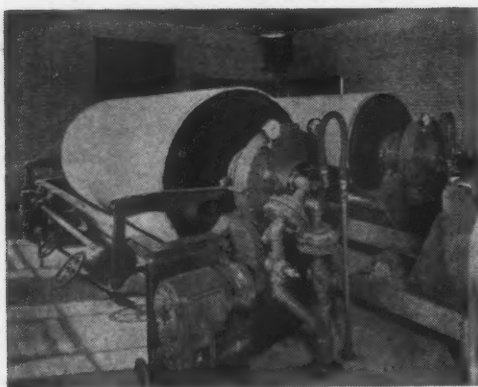
4 THINGS TO DO to keep prices down and help avoid another depression

1. Buy only what you really need.
2. When you buy, pay no more than ceiling prices. Pay your ration points in full.
3. Keep your *own* prices down. Don't take advantage of war conditions to ask more for your labor, your services, or the goods you sell.
4. *Save.* Buy and hold all the War Bonds you can afford—to help pay for the war and insure your future. Keep up your insurance.

**HELP
US
KEEP**

PRICES DOWN

A United States War message prepared by the War Advertising Council, approved by the Office of War Information, and contributed by this magazine in cooperation with the Magazine Publishers of America.



Vacuum filters at Cuyahoga Falls, Ohio.

The Sewerage Digest

Abstracts of the main features of all important articles dealing with sewerage and sewage treatment that appeared in the previous month's periodicals.

Industrial Wastes As a Municipal Problem

Disposal of industrial wastes is usually not a health problem but one of preventing a nuisance. Such cost as is to be borne by the industry must be such as it can pay and still operate at a profit; and the process must not interfere appreciably with production or plant arrangement. The life of an industrial plant is indefinite, and the cost of a plant for pretreating its waste before discharge into a public sewer should be amortizable in a short period.

Municipalities are obligated to dispose of normal domestic sewage only. It may refuse to receive wastes other than this, or receive them only after pretreatment at the cost to the industry, or charge the industry for treating them, or treat them without charge. As a basis for charging for treatment, the normal volume, suspended solids and B.O.D. of the domestic sewage should be ascertained, per capita, and compared to the assessed valuation per capita in residential areas. Then the volume, solids and B.O.D. per \$1,000 assessed valuation can be calculated and used as a basis for computing excess charges. A certain amount of these per \$1,000 assessed valuation of an industrial plant could be treated free and a price set per unit for treating excesses above these.

In some cases the wastes may not be objectionable. An acid waste may discharge into alkaline sewage, which neutralizes it. In one case copper sulfate discharged into a sewer had the same effect as the chlorine that was being discharged into the sewer at intervals below, and it was possible to discontinue the chlorination. No charges for these seem justified.¹¹⁰

Effect of Treatment on Streams

To determine to what extent treatment of domestic and industrial wastes is relieving stream conditions in Maryland, four streams in the vicinity of populated areas were investigated, using bacteriological and chemical analyses of samples above and below sewer outfalls both before and after treatment was inaugurated.

Hagerstown, population 33,000, discharges its sewage into a flowing stream, employs competent full-time operators, and frequently turns out an effluent better than the stream into which it discharges. Annapolis, population about 13,000, has only primary treatment but discharges into a body of tidal water, the Severn river, which furnishes ample dilution and conditions have been greatly improved by this treatment. (See illustration.)

Belair, population about 2,000, uses an Imhoff-trickling filter plant with chlorination and discharges into a very small stream. When properly operated the stream conditions are good; but the plant is negligently operated and the town has had to pay damages to farmers for the result

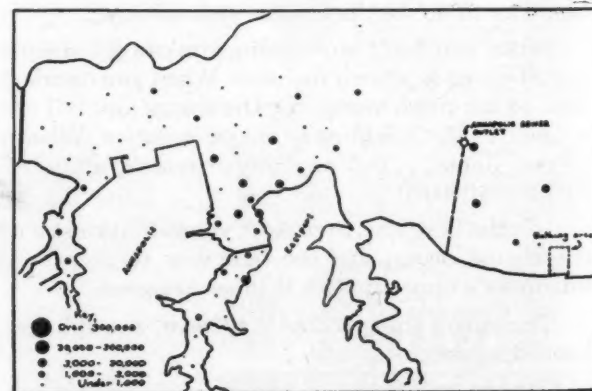
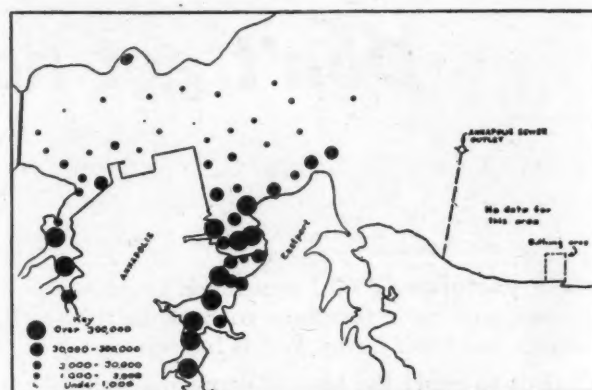
*See Bibliography in the January issue.

of frequent neglect. Chestertown, population 2,800, discharges into the Chester river the effluent from plain sedimentation and chlorination. The river here has tidal ebb and flow. The results are not consistently good; chlorination is frequently omitted.

The conclusion is that the results in improving stream conditions would be good in all these cases if the plants were properly operated.¹¹²

Odors From Treatment Plants

Designers of plants must share with the operators responsibility for odors. They should provide wash-water systems with good pressure and easily applied at all points; insure delivery of sewage at the plant as fresh as possible; and that it is not retained in pump wells or elsewhere long enough to putrefy. Covering buildings; burning odors at 1,500° F. or higher, or use of chemicals are sometimes



Courtesy Sewage Works Journal

Annapolis maximum coliform indices at ebb tide, before and after treatment was inaugurated.

desirable. Complaints about odors will be much less frequent if the plant and grounds have an attractive appearance.^{115*}

Designing Soakaways

Soakaways have been used for absorbing the runoff from roofs of buildings and paved areas and even the runoff from highways. They consist of a hole dug in the ground and filled with rubble; if it proves too small it can readily be enlarged; if it is too large, no one is the wiser. Scientific design involves knowing the rate and duration of maximum rainfall and the soakage rate of the ground in which it is dug. The latter can be learned by actual trial in a test hole, filling it with water and timing the rate at which the water level falls. The author describes the procedure in detail.¹¹⁸

Disposal of Liquid Wastes

The problem of industrial waste disposal is becoming serious. U.S.P.H.S. reports that 1,604 industrial plants discharge into the Ohio river alone wastes having a population equivalent to ten million people, and the wastes in the Sanitary Dist. of Chicago are equivalent to 2,700,000. The industrial load on the water courses of the United States is greater than the total load from domestic sewage. With a little study there could be salvaging, separation of wastes, changing of processes, recirculation of water, and regeneration of processes which would not only minimize stream pollution but in many cases net financial returns. Food processing is the most important producer of wastes in the country as a whole, but in the Ohio basin chemical wastes are three times as important.

Regardless of final disposal, the volume and strength of wastes should be reduced to a minimum as near to their sources as possible, using screens, settling basins, biologi-

cal processes, evaporation or other treatment, selecting this with care. In some instances the recovery of by-products has been extremely profitable, including recovery of sulfur, solvents, alcohol, metallic salts, pigments, phenol, corn by-products, glutamic acid, activated carbon, grease, fertilizer and animal feed.

Certain wastes must be particularly treated to prevent poisoning of surface and underground water supplies. Arsenic from ammunition plants and chromium from plating plants have endangered underground water supplies.

Certain wastes, if freed of free oil or acid, may be actually beneficial in sewers or treatment plants. Sludge from water softening plants does not interfere with sludge digestion. Meat packing and cannery wastes are objectionable only as they increase population equivalents. Sugar, molasses, orange pulp and whey should under no circumstances be placed in sewers. Pretreatment may be necessary to protect pumps and prevent corrosion of pipe lines. Los Angeles forbids placing in sewers wastes with temperatures over 100°F., or containing suspended solids over 1,000 ppm or oil over 600 ppm, or any explosive gases, and the pH must be between 5.5 and 9.0.^{119*}

Factors Affecting Chemical Treatment

Good quality digester supernatant liquor has little if any effect on the coagulation of sewage with ferric chloride. Liquor from partly digested sludge or fresh solids increased coagulant demands considerably when 10% was added to sewage.

The iron content of effluents produced by treating sewage with ferric chloride was lowest near the range of optimum clarification. Dosages below this range yield effluents containing appreciable iron which are capable of producing unsightly effects.

Treatment of various types of sewage to complete clarification with ferric chloride or ferric chloride and lime

SEWER CLEANING "KNOW HOW"

Two things are needed for a first-class sewer cleaning job — "Know how" and the right equipment.

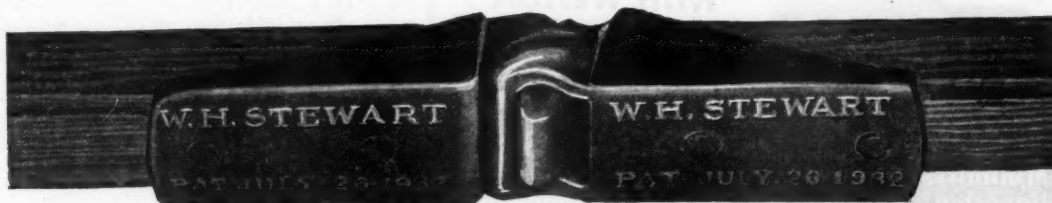
And the "know how" must be had not only by those supervising and doing the work but by the manufacturer furnishing the tools and equipment. For there is no such thing as all-purpose sewer cleaning equipment. Different jobs and different phases of these jobs call for different tools.

Knowing what a full line of such equipment is, and how to design and make it, is where

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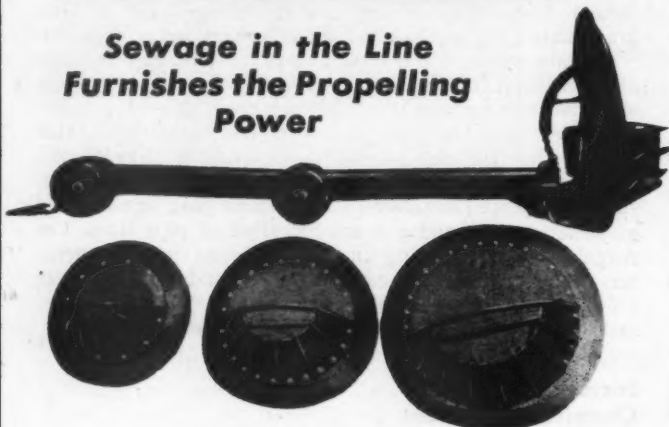
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reduced the chlorine demand to about 1/3 that of the raw sewage. Ferric chloride-acid treatment produced a reduction of only 25%.

Chlorination of effluents produced by use of ferric chloride alone or with lime produced measurable reduction in B.O.D.

Seawater infiltration can aid coagulation of sewage with ferric chloride by lowering the dosage required to produce a high degree of clarification, but affects settling adversely.

Coagulation with ferric chloride was unaffected by temperature changes between 50° and 105° F.^{H4}

Explosion at Monroe Sewage Plant

At 11:06 P.M. October 4th an explosion occurred at the treatment plant of Monroe, Mich., which blew out the north wall of the building and part of the SE corner and the roof sections. No equipment except boilers and sump pump were harmed; the electric pumps were put in operation the following afternoon and by the close of the day the treatment plant was in operation in all respects except chlorinating the effluent and digestion of the sludge. An engineering firm and a contracting firm estimated the cost of repairs at \$27,963 and \$27,859, respectively. Insurance was carried for \$75,200. The operator suffered from shock and a cut over one eye. The explosion is believed to have been caused by gas unaccountably accumulated in the valve house and unexplainably ignited.^{H5}

Spherical Gas Holder Not Corroded

In 1937 Green Bay, Wis., put into service a Horton-sphere gas holder 50 ft. in diameter. It was shop coated on the inside surface with Armstrong 88v and after erection the inside was given two more coats of the same. Six years later an inspection found the inner surface in excellent condition with no signs of corrosion or pitting. (The holder remained full of gas and the inspector was equipped with hose mask, safety belt, safety flashlight, rubber shoes, and a non-sparking scraper.)

The outside of the sphere had been given a shop coat of Armstrong 88v and, after erection, two coats of Armstrong aluminum paint. By 1943 the paint had started to peel, particularly along the welds, and the sphere was sand-blasted to bright metal, sprayed with a coat of Truscon quick drying red lead primer and a heavy finish coat of Barox steel tank gray.^{H7}

Liquor From Heat Treatment

The "Porteous" heat treatment for conditioning and dewatering sludge produces a by-product liquor which is greenish-yellow when fresh, turning black on storage. A typical analysis gives 10,180 ppm total solids, 1,600 ppm total ash, B.O.D. 3,690, Kjeldahl nitrogen 1,630 ppm. The impurities are almost entirely in true solution and largely of a nitrogenous character. A heat treatment plant has been in operation at Halifax, England, for 5 years and the liquor disposed of simply by returning it to the main sewage flow. Comparing average analyses for the 4 years previous to the adoption of heat treatment and the 4 years following, the B.O.D. of the tank effluent was 157 ppm and 169, respectively; of the settled filter effluent, 17.6 and 18.8; and of the aeration plant effluent 13.0 and 14.1. The albuminoid nitrogen of the settled filter effluent averaged 1.45 and 1.40, respectively. It was concluded that "regular addition of an average amount of 0.23 per cent of heat treatment liquor from secondary sludge to the Halifax sewage has not resulted in any material deterioration in effluents from percolating filters on aeration units."^{D8}

Ventilating Los Angeles Sewers

Los Angeles, Calif., operates three stations for ventilating sections of its sewer system by forced draft. One is located in the middle of a 6-mile section of a 9.5 x 12.3 ft. sewer, where two blowers discharge 44,000 cu. ft. of air per minute through a stack 80 ft. high to prevent dis-

integration of the sewer by keeping the walls dry so that sulphuric acid will not form.

Another installation removes odors trapped by an inverted siphon, exhausting 7,000 cu. ft. per minute through a stack 80 ft. high. The third installation eliminates explosive atmospheres formerly present, exhausting 2,500 cu. ft. of air per minute, which is deodorized by sprays of sodium carbonate solution and discharged through a 70 ft. stack.^{E3}

Chicago Runoff Formula

In designing Chicago's storm sewers the engineers use the rational method, runoff = CIA. Until recently they calculated I (the intensity factor) by the formula $I = \frac{137}{T+18}$, T being the duration of a storm corresponding to the time of concentration, allowing for storms of 5-year frequency; but in 1943 they adopted the formula $I = \frac{90}{11 + \frac{t}{.09}}$ for 5-year storms, based on the latest rainfall data.^{X1}

Bibliography of Sewerage Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c. Indicates construction article; n, note or short article; p, paper before a society (complete or abstract); t, technical article.

- D The Surveyor**
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3. Surface Water Run-off From Small Areas. By L. B. Escritt. Pp. 583-585.
 4. p. Effect of Treatment in Percolating Filters on Bacterial Counts. By L. A. Allen, T. G. Tomlinson and Irene L. Norton. Pp. 585-587.
 5. p. The Corrosion of Cement and Concrete. By C. Hamerton. Pp. 587-589.
- December 8**
6. p. The Corrosion of Cement and Concrete. By C. Hamerton. Pp. 599-601.
- December 15**
7. p. Future of Sewage Disposal. By James H. Edmondson. Pp. 609-610.
- December 22**
8. p. Disposal of Liquor Resulting From Heat Treatment of Sludge. By C. Lumb and J. P. Barnes. Pp. 621-624.
- E Engineering News-Record**
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1. p. Notes on Industrial Waste Utilization. Pp. 62-63.
- January 11**
2. Sanitation Safeguards at Navy Bases. By N. A. Bowers. Pp. 133-136.
 3. p. Forced Ventilation of Sewers Retards Sulphide Disintegration. By Richard Pomeroy. P. 139.
- G Water Works and Sewerage**
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1. The Sanitary Engineering Division of the U. S. P. H. S. Pp. 436-437.
- H Sewage Works Engineering**
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4. Research Covers Factors Affecting Chemical Treatment. By Harry W. Gehm. Pp. 12-14.
 5. Three Years' Experience With Activated Sludge Treatment. By Erwin A. Bartz. Pp. 15-18.
 6. Monroe Sewage Plant Blast Displaces Building Walls. P. 19.
 7. Spherical Digester Gas Holder Unaffected by Corrosion. By George Martin. Pp. 21-22.
 8. Heating Sludge Digesters. Pp. 27-28, 36.
- J American City**
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3. Water and Sewage Treatment for Neosho, Mo. By H. D. Smelser. Pp. 72-73.
 4. Wartime Sewerage Projects. Pp. 99, 101, 103.
- K Proceedings, American Soc. of Civil Engineers**
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1. Flow in a Channel of Definite Roughness. By Ralph W. Powell. Pp. 1521-1544.
- M Water and Sewerage**
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3. Toronto's Sewage Treatment Plant. By W. E. Micklethwaite. Pp. 15-17, 46.
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 5. Sewerage Systems as Postwar Work. By R. Howard Shook. Pp. 20-40.
- P Public Works**
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4. War Changes a Sewage Plant. (Alliance, O.). By Donald D. Heffelfinger. Pp. 16, 42.
 5. Adjusting Sewage Treatment to River Condition. Pp. 25-26, 46.
 6. Aeration of Huddersfield Percolating Filters. Pp. 28-29.
- X Journal, Western Society of Engineers**
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1. Chicago Sewer System. By A. J. Schafmayer. Pp. 300-315.

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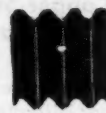
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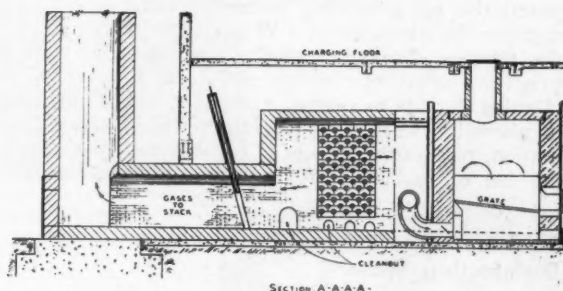
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One million gallon radial cone bottom tank at Beaumont, Texas.

Copper Sulfate At Durham, N. H.

Owing to decayed vegetation, the color of the impounded water supplied to Durham, N. H., goes as high as 130 ppm, and 50 ppm of alum and 12 of activated carbon are required to eliminate color and odor, which shortens filter runs 25%. When the necessity for these heavy doses ceases, the filter beds are treated with caustic soda for 48 hrs and the coagulation basin is emptied and cleaned.

Algae in the reservoir have caused trouble and now the temperature of the water is taken daily and when it rises to the vicinity of 65° F the reservoir is treated with copper sulfate every two weeks for the remainder of the summer.^{B5*}

Disinfection by Chlorine Dioxide

Chlorine dioxide (ClO_2) is a powerful oxidizing gas. Because of its instability it cannot be produced in bulk and stored but must be generated in very low concentrations at the point of use and consumed immediately. Recently a method of generating it by treating dry sodium chlorite with chlorine has been developed. But for treating water supplies a wet method is more applicable, the most practicable one consisting in feeding sodium chlorite solution into the discharge of a W & T chlorinator and passing the mixture through a mixing chamber. Niagara Falls pre-treats with chlorine for disinfection and treats with chlorine dioxide to destroy tastes and odors due to algae or phenolic wastes. This treatment permits continuous operation, reduces the amount of chlorine required, eliminates the use of carbon, and simplifies operation by making breakpoint measurements unnecessary.^{B6*}

Tablets for Disinfecting Water

Water-disinfecting tablets for rendering safe small amounts of water for use by hunters, boy scouts and travelers in foreign lands must: 1—Disintegrate or solubilize rapidly when dropped into water; 2—liberate their active ingredients quickly, even without stirring; 3—destroy all significant disease-producing organisms in a short contact period; 4—be effective in all kinds of natural waters; 5—not impart undesirable qualities to the water; and 6—maintain their strength in storage and use.^{B7*}

Stopping Leakage Through a Ledge

At Great Falls Dam of the T. V. A. about 10% of the water impounded leaked past the dam through the horizontal seams of a limestone ledge, 17 leak outlets

*See Bibliography in the January issue.

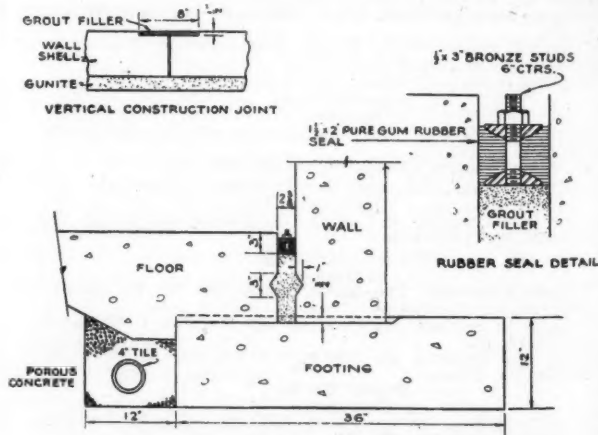
The Waterworks Digest

Abstracts of the main features of all important articles dealing with waterworks and water purification that appeared in the previous month's periodicals.

being located in a length of ledge of about 4,000 ft. A test for a method of stopping these was made which completely stopped one leak. Along a line 60 ft. back from the face of the bluff 3" diamond-drill holes were sunk at 20 ft. centers, the cavity located and hot asphalt grout pumped into it. Then additional holes were drilled on 10 ft. centers and grouted; about 5,500 cu. ft. of asphalt being used altogether. This stopped the leak and it has not reappeared after 6 months. Other holes on 5 ft. centers 35 ft. back of the asphalt holes were drilled and cement grouted as an additional precaution.^{B4}

Prestressed Concrete Tanks

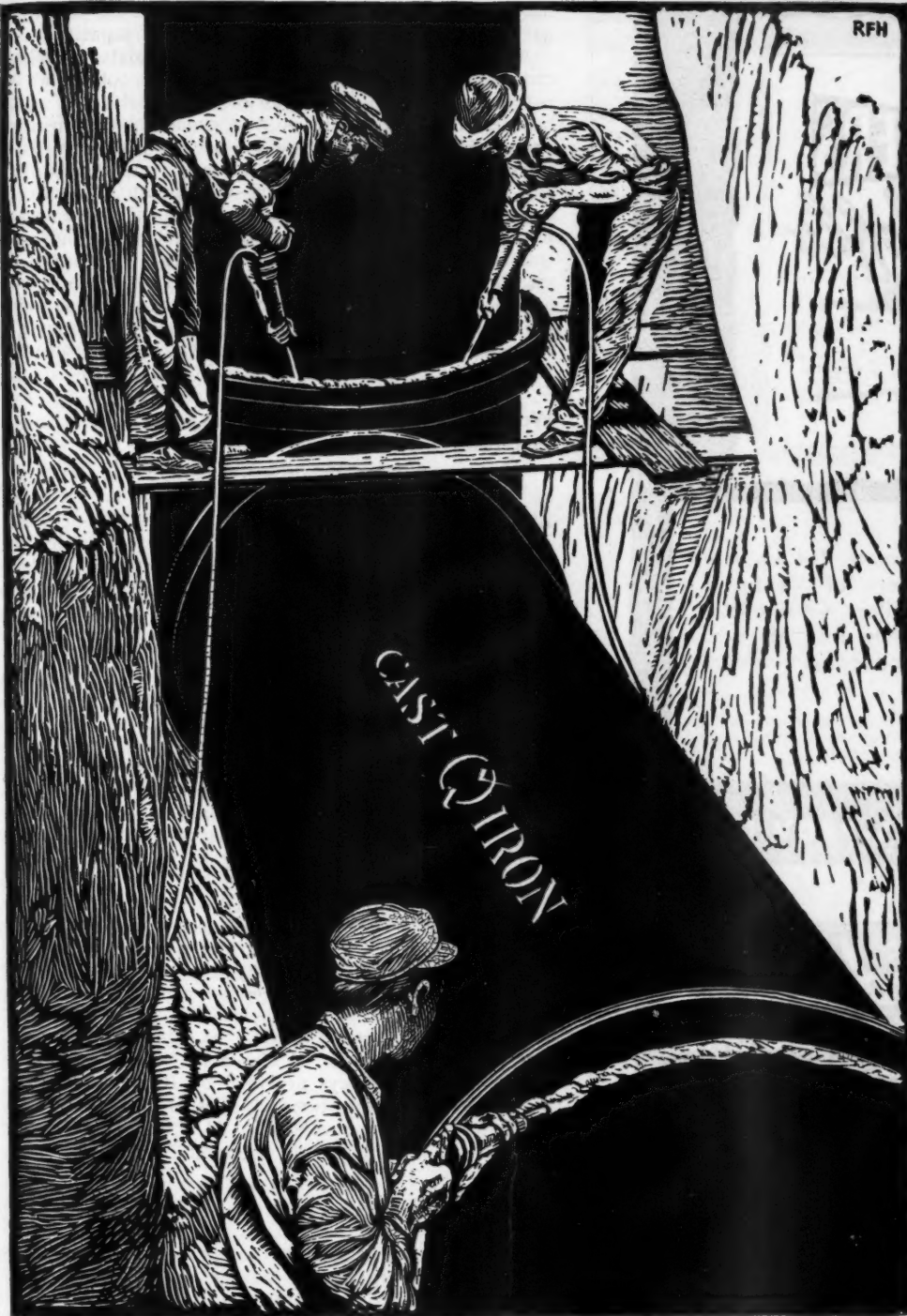
The East Bay Municipal Utility District (California) has constructed 12 prestressed tanks with capacities ranging from 3.5 mil. gal. (160 ft. diameter) to 200,000 gal. and "has developed technic of design and construction that yields uniformly satisfactory results with economy of cost." The advantages of this type of tank are 1. High degree of water-tightness. 2. Permanence, with low cost for upkeep. 3. Adaptation to architectural treatment. 4. Adaptation to partial or complete burial underground. 5. Simple and accurate determinacy of stresses. 6. If properly constructed, high degree of resistance to damage from earthquake action. 7. Minimum of critical materials involved. Undesirable characteristics are: 1. Relatively high first cost as compared with wood or steel tanks. 2. Impossibility of removal to another site. 3. Relatively great weight to support if tank is to be of the elevated type. The costs per mil. gal. capacity of the District's tanks



DRAINAGE GUTTER AND SEAL RECESS DETAIL

Courtesy American Water Works Assn.

Details of joints, prestressed concrete tank.



Drawn for U. S. Pipe & Foundry Co. by the late R. F. Heinrich

While the first object of this Company continues to be production for the sinews of war, we are still making cast iron pressure pipe for vital public services such as water supply, gas and sewerage systems. We can supply your pipe requirements with reasonable promptness, subject to governmental regulations.

U.S. cast iron PIPE

U. S. PIPE & FOUNDRY CO.
General Offices: Burlington, N. J.
Plants and Sales Offices throughout
the U. S. A.

A propeller-type flow meter for water service by the makers of Venturi Meters, Venturi Controllers, Chronoflo Telemeters and a broad line of related water and sewage works equipment.

Send for New Bulletin 350. Address Builders-Providence, Inc. (division of Builders Iron Foundry), 9 Codding St., Providence 1, R. I.

Sincerely BUILDERS-PROVIDENCE

Streamlined INSIDE
for Higher Efficiency and Lower Operating Costs

RUGGED SIMPLICITY OF DESIGN ELIMINATES RECIRCULATION -

DELIVERS GREATER VOLUME PER GAL. OF GAS

NO ORIFICE OR PRIMING VALVES TO CLOG OR JAM

CAPACITIES UP TO 125,000 GPH

NEVER LOSES PRIME REQUIRES LITTLE ATTENTION

CLOSE COUPLED TO MOTOR

GAS OR ELECTRIC

Streamlined where it counts, you can't clog a Gorman-Rupp Self-Priming Pump. Unequaled in rugged efficiency, gallonage or continuous hours. A size and type for every need.

THE GORMAN-RUPP COMPANY, MANSFIELD, O
GORMAN-RUPP
SELF-PRIMING CENTRIFUGAL PUMPS

When writing, we will appreciate your mentioning PUBLIC WORKS

have ranged from \$43,049 for those of 200,000 gal. capacity to \$22,936 for those of 3 mil. gal. capacity.

The wall is not attached to the floor slab, but either can expand or contract because of the smooth joint between each of them and the 36" footing, and a 2 3/8" space between them filled with two pure gum rubber strips compressed between rings of steel. (See cut). The wall is 6" thick at the top, increasing by 2" inside offsets to provide for increase of water pressure with depth. At least 10 days after pouring the wall, steel bands are placed around it. These are square, of manganese steel; their ends pass through holes in vertical steel beams set in the face of the wall and stress in the bands is produced by means of nuts on the ends of them; the amount of final torque being limited by use of a special wrench. Welded wire mesh is fastened around the entire outer surface as reinforcement for a 2" gunite coating.^{A23}

Water Supplies In Great Britain

The area of Great Britain is less than that of California, of Illinois and Indiana, or New York and Pennsylvania; with as many people per square mile as Massachusetts. Nearly 30% of the people living in rural districts are not reached by water mains and there is a general opinion that, as part of the postwar program, there should be provided "as a minimum, a piped water supply to communities of approximately 250 persons resident within about a quarter-mile radius, unless it is found in any particular case that the cost is prohibitive." A committee appointed by the Minister of Works has reported: "We consider the provision of a piped water supply an essential service in every village and on every farm and a desideratum in every dwelling"; and that, to effect this, "all water undertakings should be brought under the national planning control, while leaving the supervision of their development functions to the appropriate executive Ministry."

The British Waterworks Ass'n last year recommended "The establishment of a Central Water Authority to conserve the water resources of the country and to consider and decide conflicts between various authorities interested in water"; and also of a "Board of Public Water Supply having general jurisdiction over the water supply industry to whom problems which are exclusively the concern of water supply undertakers should be submitted."

A bill in the House of Commons "provides for contribution out of moneys provided by Parliament towards the cost of improving water supplies in rural localities up to an aggregate not exceeding £1,000,000 in England and Wales and £137,500 in Scotland."^{A13}

Runoff From Watersheds

Two papers discuss the runoff from the watersheds providing the supplies of Seattle and Tacoma, Wash. The former is derived from the Cedar River Watershed, of which the city owns 64,000 acres, on which logging has been permitted, but some citizens objected to this as introducing a serious pollution hazard. A commission consisting of Abel Wolman, Carl Green (engineer) and Bror L. Grondal (Prof. of Forestry) reported that, due to the porosity of the soil, there is virtually no surface runoff, and hence erosion is not accelerated by the removal of the forest cover; that storage of snow is somewhat increased when the larger trees are replaced by young stock; lack of erosion prevents any increase of turbidity in the stream due to timbering; pollution hazards due to logging are very minor compared to those due to a railroad and public highway crossing the watershed, and a manufacturing plant and small town located on it, and chlorination or other treatment are desirable for all surface water. Revenue from logging can pay a large part of the administrative costs of the water department and furnish employment for several thousand persons.^{A14}

Tacoma's chief source of supply is the Green river, supplemented by wells when the turbidity of the river water exceeds 10 ppm or the demand exceeds the capacity

of the pipe line from the intake. Except for some 8,000 or 9,000 acres of level land, the watershed is rugged, rising abruptly from a narrow valley, and two-thirds of it is covered with second growth timber. Logging was carried on for about 40 years but has now almost ceased. Danger of pollution by the 250 to 350 dwellers on the watershed is controlled by daily inspection and enforcement of sanitary regulations. Where large areas have been denuded of the forest cover, erosion and consequent turbidity occasionally makes the water unfit for use for days or weeks. The average runoff is 68.3% of the precipitation: "the scant cover of surface soil on the rocky mountain slopes can only absorb and hold a limited proportion of the total precipitation." Congress has passed a bill the purpose of which is "to promote sustained-yield forest management in order thereby (a) to stabilize communities, forest industries, employment and taxable forest wealth; (b) to assure a continuous and ample supply of forest products; and (c) to secure the benefits of forests in regulation of water supply and stream flow, prevention of soil erosion, amelioration of climate and preservation of wild life."^{A15}

Subways for Service Lines

Use of a single subway in each street to contain all the water, gas and other mains, cables, etc., has the following advantages: 1. Removes interference with traffic. 2. Facilitates inspection and maintenance. 3. Permits growth of system to meet demand. 4. Obviates road openings and maintains stability of road base and sidewalk pavement. 5. Eliminates recurring excavation costs and reinstatement charges. 6. Permits salvage of redundant plant. 7. Gives certainty of location. 8. Less street width needed.

Disadvantages are: 1. Initial costs higher than laying. 2. Accidents likely to be more serious. 3. Must be under control of authority. 4. Difficulties at crossings. 5. Sewerage costs increased.^{D1}

Hydrant Inspection in Miami

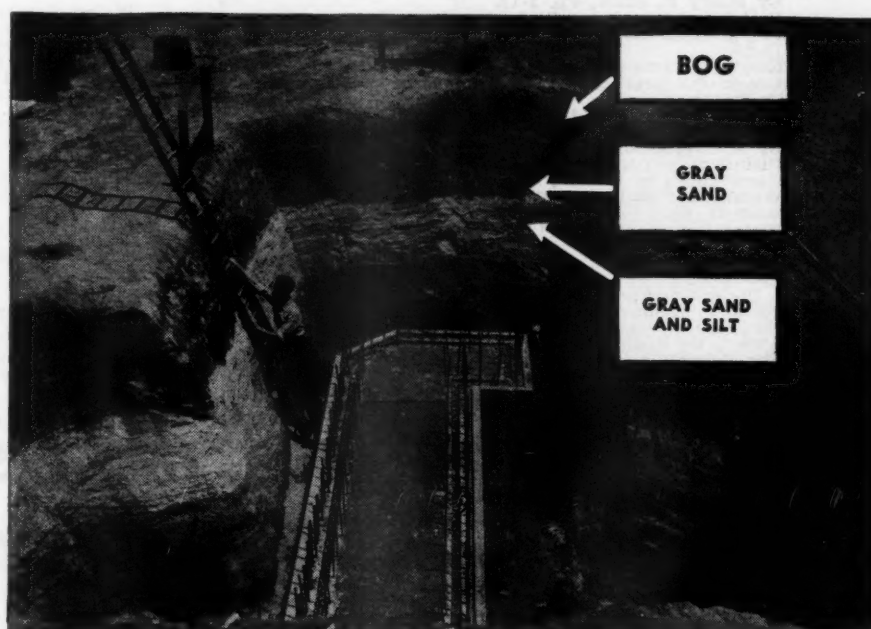
In Miami, Florida, the Fire Dept. is responsible for hydrant maintenance, and all members of engine companies take turns in inspecting the hydrants so as to learn the location of all of them. The procedure is to tighten the caps, then open the hydrant full and look for leaks in barrel, drain valve, main stem packing or elsewhere; close the hydrant, remove steamer cap and flush. Remove all caps, wash threads of caps and nozzle, examine for undue wear; check main valve for leakage; see that hydrant wrench fits properly. Check number of turns to start water flowing—more than two indicates undue wear of valve stem or operating nut.

Hydrants are flushed and inspected once every 60 days; nozzles and caps are lubricated once every 4 months; hydrants are painted annually. Hydrants that have been in service 15 years or longer need internal inspection, for corrosion of hydrant stems, crumbling valve leathers, worn threads on the upper end of valve stems, corroded jam nuts, loose bushings in base elbows, and tuberculation inside the barrel.^{F9}

Interruptions of Electrical Supply

The author cites thirty instances of interruptions of electrical supply to water works plants, which he says is far from being a complete list. He therefore advises providing emergency service, such as internal combustion engines for operating pumps, and possibly reserve generators operated by these for furnishing current for motor-operated soda feeders, revolving screens or agitators. Also there should be elevated storage, preferably of capacity sufficient for fire protection during a pump shutdown. Hurricanes, earthquakes, etc. may affect large areas, and the most complete interconnection of basic high-voltage power lines is not safely adequate.^{A17}

• A GRIFFIN WELLPOINT JOB •



AND GRIFFIN WELLPOINTS 75 FEET DISTANT!

Yes—the Griffin Wellpoints installed around an area 75 feet away so thoroughly predrained the ground that no additional wellpoints were needed—and no shoring or sheeting either! Dense stuff, hard to predrain—yet Griffin Equipment DRIED IT! Results count—why say more?

FOR SALE OR FOR RENT

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MAIN OFFICE: 881 EAST 141st STREET, NEW YORK 54, N. Y.
GRIFFIN WELLPOINT CORPORATION

Disinfecting New Mains

Extensive tests of various methods of making joints and of sterilizing pipe after laying led the author to conclude that "the sterilization of mains in place can be accomplished with some uncertainty as they are laid at present. Explosive growth of bacteria may come from seed in and on pipe lining rather than from sterilized packing material, either hemp or rubber. A more offensive dead-end odor develops in ferrous than in non-ferrous lines. The multiplication of bacteria occurs in both ferrous and non-ferrous lines, but to a lesser extent in the latter." ^{A18}

Bibliography of Waterworks Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c. Indicates construction article; n, note or short article; p, paper before a society (complete or abstract); t, technical article.

- A** *Journal, American Water Works Ass'n*
January
13. A Review of Current British Thinking on Water Supply. By Harry B. Shaw. Pp. 1-14.
 14. Relation of Runoff and Water Quality to Land and Forest Use in Cedar River Watershed. By Bror L. Grondal. Pp. 15-20.
 15. Relation of Runoff and Water Quality to Land and Forest Use in the Green River Watershed. By W. A. Kunigk. Pp. 21-31.
 16. Water Hammer. By J. C. Stevens. Pp. 32-39.
 17. Interruptions of Electrical Supply to Water Works Plants. By A. C. Hutson. Pp. 40-45.
 18. Disinfection of New Mains. By Cecil K. Calvert. Pp. 46-51.
 19. Bacteriology of Water Pipes. By Carl Wilson. Pp. 52-58.
 20. Water Conservation in Washington, D. C. By Edwin A. Schmitt. Pp. 59-65.
 21. Water Conservation in Philadelphia. By Martin J. McLaughlin. Pp. 66-69.
 22. Foot Valves on Centrifugal Pumps. By Robert W. Angus. Pp. 70-72.
 23. c. Design and Construction of Prestressed Concrete Tanks. By R. C. Kennedy. Pp. 73-83.
 24. Canada's Ground Water Resources From a Geological Aspect. By B. R. MacKay. Pp. 84-100.
 25. The Rehabilitation, Cleaning and Sterilization of Water Wells. By Loren E. Blakeley. Pp. 101-114.

- D** *The Surveyor*
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1. Planning of Underground Services. By J. Paton Watson. Pp. 569-570.
- December 8
2. p. Behavior and Treatment of Iron-Bearing Waters. By J. H. T. Griffiths. Pp. 595-601.
- E** *Engineering News-Record*
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4. Reservoir Leakage Stopped at Outlets. By L. A. Schmidt. Jr. Pp. 137-139.
- F** *Water Works Engineering*
December 27
3. Development of Water Supply at St. Petersburg, Fla. By H. T. Oberly. Pp. 1512-1515.
 4. Rapid Sand Filter Bottoms. Pp. 1518, 1532.
 5. The Pitot Tube in Theory and Practice. By George E. Russell. Pp. 1523-1524, 1533.
- January 10
6. Depleted Wells at Louisville Recharged With City Water. By W. F. Guyton. Pp. 18-20.
 7. p. How Service and Meter Sizes Are Fixed at Brookline, Mass. By Walter B. Bushway. Pp. 27-28.
 8. Rapid Sand Filter Beds. Pp. 29, 44.
 9. Hydrant Inspection, Tests and Maintenance Pay Dividends. Pp. 31-32, 51.
 10. p. Industrial Supply Developed for Fall River, Mass. War Needs. By John L. Hayden. Pp. 33-34, 52.
- G** *Water Works and Sewerage*
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1. Water Supply vs. War Demands in Norfolk, Va. By Norman Z. Ball and R. W. Fitzgerald. Pp. 407-411.
 2. Direct-Reading Gage for Fire Hydrant Flow. By A. A. Hirsch. P. 412.
 3. p. Chlorine Dioxide—A Development in Treatment of Potable Water. By John F. Synan, J. D. MacMahon and G. P. Vincent. Pp. 423-426.
 4. Ionic Equilibrium in Water. By H. M. Giff. Pp. 427-430.
- J** *American City*
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3. Filling Water Needs at Hampton Roads. Pp. 67-69.
- M** *Water and Sewage*
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1. Troubles Due to Micro-organisms. By Rudolph E. Thompson. Pp. 21-22, 30.
- P** *Public Works*
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4. An Emergency Water Supply Pumping Station. By J. McClure Wardle. Pp. 18-19, 48.
 5. Recalcining Sludge from Water Softening. Pp. 22-23, 30.
 6. Remedying Shortcircuiting in Sedimentation Basins. By Nathan H. Weiss. P. 27.

Flexible Does The IMPOSSIBLE Again

"IMPOSSIBLE!" SAID SIX ENGINEERS WHEN THEY SAW THE CONDITION OF THIS 33-YEAR-OLD SALT WATER PIPE LINE

ONE LOOK at this salt water pipe line filled with a coral crustacean and a variety of tubipore marine growths would convince anyone that this pipe could not be made serviceable. For 33 years it lay untouched until its carrying capacity was restricted to 25% of its original.

Yes, Flexible cleaned the pipe line and restored its original water carrying capacity. The job was done at a fraction of the cost of replacing the pipe line and the new clean line will save thousands of dollars in pumping energy alone.

Flexible is justly proud of this job for they believe no other organization in America could have done the job as well or as fast. Have you a pipe line cleaning problem? Write us about it, today!



Size of coral slugs is indicated by yard stick. Were removed from 3,000 feet of 24-inch pipe line for one of America's largest oil refineries.

615 Pickwick Bldg.
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41 Greenway St.
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**FLEXIBLE UNDERGROUND
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2645 E. 75th St.
Chicago 49
P.O. Box 694, Pittsburgh
P.O. Box 165, Atlanta
148 Hillside Ter.
Irvington, N. J.

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1. Stream Flow and Reservoirs in Maine. By M. R. Stackpole. Pp. 9-14.
 2. Reforestation and Damage Occasioned by Storms. By Lyndall K. Parker. Pp. 16-21.
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1. Power Units Used for Pumping Water. P. 1-7, 10.

Regulating the Development of Suburban Property

(Continued from page 23)

developers did not oppose the passage of this ordinance, and when called in to discuss it, they asked for only minor changes.

It seems to me that every growing city should have some such regulations of land sub-division in force if the city is to place the burden of public utilities where it belongs.

The ordinance referred to is entitled "An ordinance regulating the sub-division or resub-division of lands into lots, plots or building sites; providing for submission and approval of maps or plats for such sub-division or resub-divisions; providing for certain minimum improvements; providing for the enforcement of the regulations herein set up; and providing penalties for the violation of this ordinance."

The chief items explain in legal phraseology the following requirements:

First the developer must file with the Police Jury a preliminary plan of his property showing all existing streets, buildings, sewer, water and gas mains; and the location and dimensions of proposed streets. If this is approved, a final plan shall be filed containing all dimensions, angles, etc., necessary to fixing the locations of all streets, lots, etc. Any area that has been overflowed by rain storms at any time during the past 20 years shall be so designated on the map. The street layout shall be such as can readily be extended over tracts not now being sub-divided, and to serve as continuations of streets already existing in adjoining sub-divisions. Major streets shall be at least 60 ft. wide and minor streets 50 ft. Alleys, at least 20 ft. wide, shall be provided at the rear of all business lots, but are optional for residential lots. Where a dead end is necessary, the closed end shall have a turning loop with a minimum inside radius of 30 ft. for streets or 15 ft. for alleys. The sub-divider shall agree to drain the area adequately in accordance with plans approved by the Engineer of the Parish; to grade all streets and alleys to grades indicated by the Engineer,

the work to comply with the specifications of the Dept. of Public Works; and shall apply at least 6" of gravel to all streets. If there is a sanitary sewer main within 300 ft. of the sub-division, it shall be sewered into this main; otherwise provisions for sanitary sewerage shall be made that conform to city, parish and state laws. No sale of land to be used for a building site will be recorded unless this land be included in a sub-division plat approved as above by the Police Jury, nor will a building permit be issued, nor any public money be spent for sewers, water or other public utility, for any property not so included. Punishment for violation—a fine of \$50 or less, each day a violation is permitted to exist constituting a separate offense.

SINCE 1890

"SOMEWHERE
IN ENGLAND"

Ever since men now old were young, Buffalo-Springfield rollers have been "old reliables" in the field of road construction. No other make can match them for low cost of maintenance over the years—in peace or in war.

Soon still more efficient models will appear on The Buffalo-Springfield line, ready to chalk up still higher performance figures—still lower maintenance costs.

Stand by for announcements.

THE BUFFALO-SPRINGFIELD ROLLER CO.
SPRINGFIELD, OHIO.



BUFFALO-SPRINGFIELD ROLLERS

When writing, we will appreciate your mentioning PUBLIC WORKS



Cleaning Up on All Fronts !

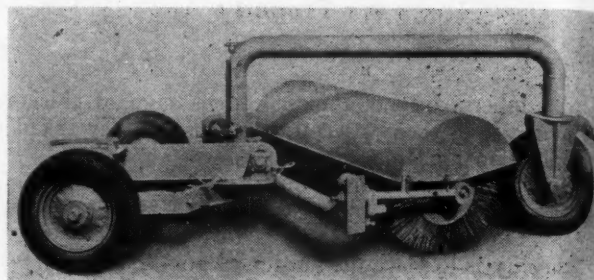
Our fighting men are doing a double "clean-up job" on all fronts. To combat dirt and disease they use modern washing machines powered by trouble-free, air-cooled Briggs & Stratton gasoline engines — one more service for hundreds of thousands of Briggs & Stratton engines, now "humming" away for Victory.

Air-Cooled Power



Manufacturers, distributors, dealers, and users of all types of appliances, tools, and equipment requiring dependable, compact power units vouch for the performance record of Briggs & Stratton engines. The latest models are backed by the experience gained in twenty-five years of continuous production of more than 2,000,000 Air-Cooled Gasoline Engines. BRIGGS & STRATTON CORP., Milwaukee 1, Wis., U.S.A.

Keeping Up With New Equipment



Littleford Road Broom

A New Traction Driven Road Broom

Littleford Bros., Inc.

452 East Pearl St., Cincinnati 2, Ohio

The New Littleford Road Brooms are made in two models—Model 106 and Model 108.

Model 106 shown here is the Traction Driven Broom, all the power is produced from the rear wheels. The Model 108 is a Power Driven Broom similar to the Traction Driven, yet is powered by an engine mounted at the rear.

Littleford Road Brooms are Two-Way Brooms that can be changed from one sweeping position to the other in two seconds time.

These Brooms also contain the exclusive Littleford features such as Hydraulic Lifting Arrangement, Mono-Frame, etc. Both the Traction-Driven and Power Driven Brooms can be turned in a small radius due to its three-wheel construction.

Sprinkling System can be added to both models and a Blower Attachment can be added to the Power Driven Broom.

For further details, write Littleford Bros.

The A. P. Smith Mfg. Co. Discontinues the Manufacture of Water Meters

The A. P. Smith Manufacturing Company, effective January 1, 1945, will discontinue the manufacture of their Federal water meter line. The company has arranged that an adequate supply of spare parts for all meters now in service shall be maintained for their customers.

The company decided upon this course after a prolonged absence from the meter field. Early in 1942 the company's Water Meter Division undertook certain direct war contracts for the production of power driven machine gun components and other war material. The expansion of this work led to the complete cessation of meter manufacture in the Spring of 1942 when Meter Limitation Order L-154 was issued.

In June of 1944 when Meter Limitation Order L-154 was relaxed to again permit the manufacture of bronze case meters, the company's commitments on war contracts which were then, and are now, being produced in its Meter Department, precluded the early return to meter manufacture.

The company has therefore, with reluctance, decided to withdraw from the meter field and concentrate its energies in the post-war period, on the manufacture of its regular line of SMITH products, namely, Gate Valves, Fire Hydrants, Water Works, Brass Goods, Tapping Machines, Inserting Machines, and Specials.

Indulin, Lignin From Pine Wood

*Industrial Chemical Sales Div.
West Virginia Pulp & Paper Company
230 Park Ave., New York, N. Y.*

This company has issued an interesting bulletin on this by-product of a sulfate paper pulp mill. Among the uses stated in the bulletin for Indulin are the increase in flow of cement concrete by dispersing the particles; for stabilizing emulsions of bituminous or asphaltic materials with water thus obtaining additional stability by the addition of an alkali which combines with the lignin; iron as the contaminating constituent of water can be removed by treatment with lignin. An interesting bulletin describes this new product and its uses in detail. Write for a copy.

Jaeger Expands Its Sales and Service Organization

To coordinate with enlargements of plant and equipment lines during the war, The Jaeger Machine Company, Columbus, Ohio, is establishing completely staffed regional headquarters in New York City, Chicago and Birmingham, Ala., to serve directly the Eastern, Midwest and Southern territories. As eastern Regional Manager L. T. Phillips will direct sales and service for Jaeger construction, paving and industrial equipment in New England and Atlantic coast states as far south as North Carolina. Branch offices for this region are being established in Baltimore, Philadelphia and Richmond. The Chicago area, in charge of V. G. Mandt, will serve the area from Illinois and Western Michigan to Kansas, Nebraska and the Dakotas with branches in St. Louis and Minneapolis.

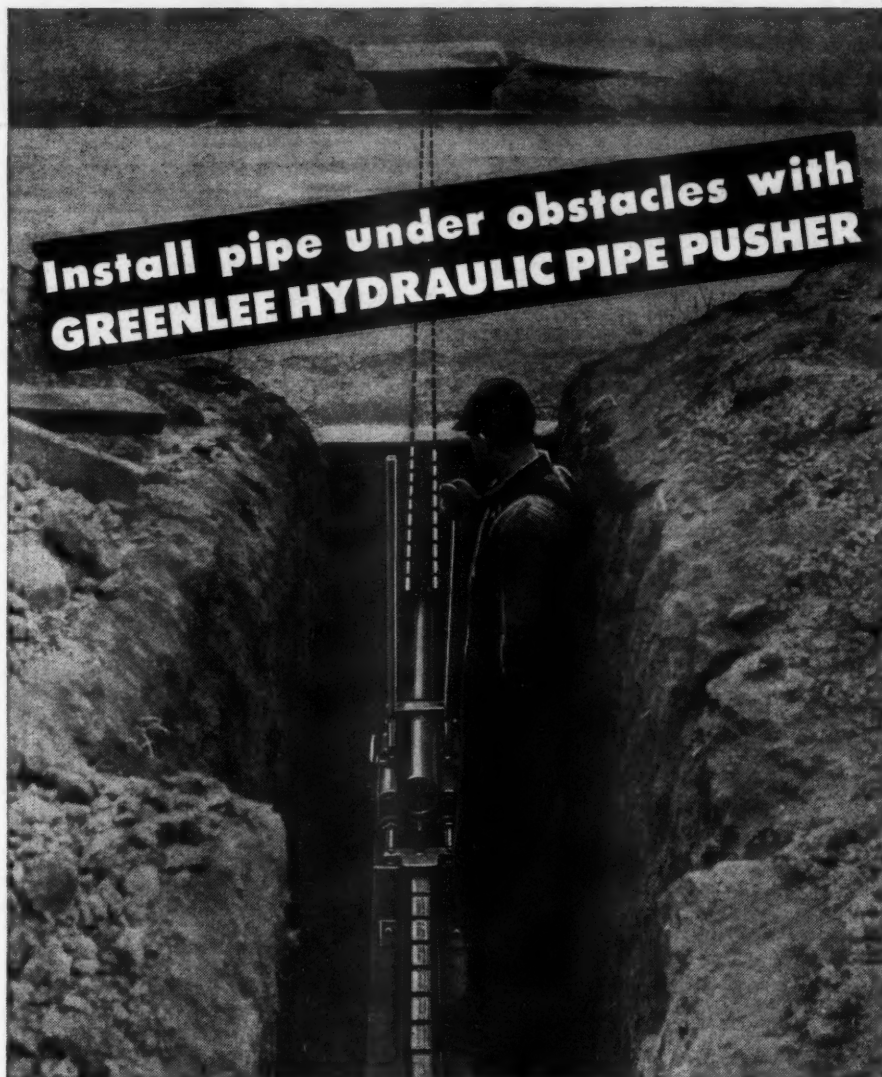
The area from Tennessee south to the Gulf and west to Arkansas will be served from Birmingham headquarters where E. G. Mandt has been appointed regional manager. Service facilities in each of the above areas will include construction and paving engineers and specialists in the Air Compressor field in which Jaeger will continue to manufacture a complete line of portable and industrial units of the type it has been producing for war needs.

Duracite Alkali-and-Acid-Resistant Cement

*The U. S. Stoneware Company
Akron, Ohio*

The manufacturer's description in part follows:

Duracite—a synthetic resin cement based on the Duralon series of synthetic resins—is characterized by extreme density, high compressive and tensile strength, and excellent resistance to acids, alkalis, hydrocarbons and solvents. It can be used as a mortar for acid-proof masonry in tank linings, floors, sewers, towers, and for other installations handling alternately acids and alkalis. It is recommended for use up to a temperature of 350°F although



One man can push pipe through the ground easily, quickly with a GREENLEE Hydraulic Pipe Pusher — under streets, sidewalks, lawns, concrete flooring and other obstacles.

Cut costs, save manpower on underground pipe installations this easy way . . . eliminate tearing up, tunneling, back-filling, tamping, re-paving. No extensive trenching, as short trench accommodates Pusher.

Easy performance . . . easy to carry and set up . . . powerful GREENLEE Pushers develop up to 75 tons pressure for your big jobs and operate at 6 speeds for varying soil conditions. A GREENLEE pays for itself in man-hours saved on first few jobs. For complete facts and price on time-and-money-saving GREENLEE Hydraulic Pushers, send today for free booklet S-117. Greenlee Tool Co., Division of Greenlee Bros. & Co., 2042 Columbia Avenue, Rockford, Illinois.



Duracite has proven satisfactory in some instances at temperatures as high as 375°F.

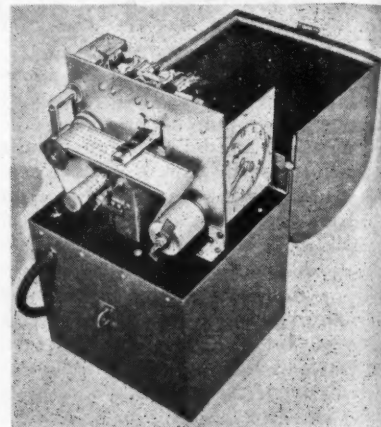
Duracite comes in the form of a liquid and powder, and can be stored indefinitely before mixing without deterioration. Duracite is 100% resin with no solvents added. Viscosity of the Duracite solution is thus absolutely uniform, assuring uniform mixing, uniform results. Duracite sets quickly, by internal chemical reaction. Setting time can be easily controlled to suit the requirements of the individual job, however, normal setting time permits continuous laying of brick. Duracite is tough, durable, easy to use. It is highly resistant to abrasion, to impact shock,

and to rapid changes in temperature. Write the manufacturer for complete information.

Trafficcounter for Measuring Highway and Street Traffic Flow

This machine, relatively new on the market, is a precision instrument consisting essentially of a pneumatic detector connected with an electric counter which automatically records vehicles running over the detector. The R. C. type Trafficcounter breaks down the traffic flow by 15-minute periods, cumulates the total to the hour, then resets and begins the operation all over again. There is a smaller model called Trafi-

counter, Jr., whose function is to total traffic without showing periodic breakdown of volume. Both are fully auto-



matic, requiring only a five or ten-minute installation job to start them working.

State highway departments were original users of Trafficcounters but the machine is now gaining steadily increasing usage by county and city engineers for automatically measuring traffic volume, breaking down that volume to show congestion, supplying flow charts and generally helping on day-to-day problems as well as on long term planning.

The Streeter-Amet Company, 4101 Ravenswood Avenue, Chicago 13, Ill., are the manufacturers and will send complete description upon request.



Clarence E. Searle

Clarence E. Searle Becomes President of Worthington Pump and Machinery Corporation

Mr. Searle succeeds Harry C. Beaver who was elected vice chairman of the Board of Directors, and chairman of Management Committee.

Mr. Beaver has been president of the Corporation since 1931, and Mr. Searle has been vice president in charge of sales since joining the Worthington organization in 1932, following a long period of service in various executive capacities with the Allis-Chalmers Manufacturing Co.

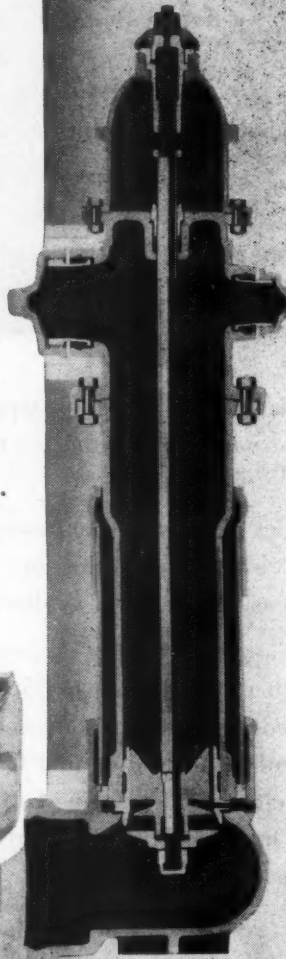
Hobart C. Ramsey, vice president in charge of operations, was elected executive vice president.

Edwin J. Schwanhauser, vice president in charge of the Corporation's manufacturing and sales operations in

CAN'T FREEZE-UP —OR DOWN!

The "innards" of a Mathews are as snug as a bug in a rug. A roof-like operating nut acts as a shield, preventing rain, sleet, snow, or hose spray from seeping in and freezing. A stuffing box keeps internal water away from the threads. An automatic drain-valve drains the hydrant dry after use.

These features are typical of the thought and care with which every detail in a Mathews Hydrant has been worked out to provide years of dependable, economical fire protection. If you are considering hydrants for your community, be sure to send for a detailed description of what Mathews Modernized Hydrants have to offer.



MATHEWS HYDRANTS

Made by **R. D. WOOD Company**

400 CHESTNUT STREET, PHILADELPHIA 5, PA.

MANUFACTURERS OF SAND
SPUN PIPE (CENTRIFUGALLY
CAST IN SAND MOLDS) AND
R. D. WOOD GATE VALVES

Buffalo, was elected vice president in charge of sales.

Leslie C. Ricketts, manager of the Corporation's Harrison Works, was elected a vice president.

Vickers Appointed Division Engineer Richmond, Va., Regional Office

C. L. Vickers, director of the Richmond regional office of the Federal Works Agency, has been designated division engineer of the new Bureau of Community Facilities which was set up within the Federal Works Agency, effective January 1, to carry out the programs of war public works and war public services handled in the past by the FWA regional office.

In his new capacity as division engineer, Mr. Vickers will continue to direct the FWA war public works and war public service programs in Virginia, West Virginia, North Carolina, Maryland and Delaware, which were under his jurisdiction as regional director.

In the administration of Lanham Act projects, Mr. Vickers will be responsible to George H. Field, whose appointment as Commissioner of Community Facilities was announced last week by Major General Philip B. Fleming, Federal Works Administrator.



Perry T. Ford

Perry T. Ford Appointed Director, Dept. of Highways

Appointed by Gov. Frank J. Lausche on January 4, Mr. Ford becomes the 16th director of highways since the department was created in 1904. He succeeds Hal G. Sours.

Particularly concerned with Ohio's gigantic postwar highway program and the manpower shortage in the department, Mr. Ford said: "I recognize the immensity and importance of the task ahead of me and I expect to proceed cautiously."

A veteran civil engineer, Mr. Ford's appointment has been widely and favorably received by the highway industry and engineering fraternities.

Mr. Ford, 56 years old, is a native of Rushmore, Putnam county. He was educated at Ohio Northern University at Ada and later received an honorary degree from the University of Dayton.

He served as division engineer in the State Highway Department during the administration of Gov. James M.

Cox. He was chief engineer of the Pan American Engineering Company and was assigned to Cuba for eight months, supervising governmental construction work. He is a member of the Society of Professional Engineers of France.

He has served as president of both the Ohio Society of Professional Engineers and the National Society of Professional Engineers.

Chicago Newspaper Man Joins American Road Builders

Norman W. Gregg, has joined the American Road Builders' Association, Washington, D. C., as Director of Public Relations. He comes to the ARBA

from Advertising Producers-Associated, Chicago, where he had been Director of Publicity for the past three years.

Mr. Gregg was Director of Publicity for Erwin, Wasey & Company Ltd., Chicago, from 1927 to 1937. During this time, he organized the promotion department of "A Century of Progress" while on a leave of absence.

Harold I. Kurtz Now With Chain Belt Co.

Formerly of the Bureau of Repairs and Utilities Branch, War Department, Mr. Kurtz has recently joined the staff of the Chain Belt Co. of Milwaukee as a Sanitary Engineer.



The Frink "V" Type Sno-Plow uses an entirely different principle than other makes. The rear of the plow is suspended from the truck attachment by two heel adjusting chains so that the weight of the snow on the moldboards is used to create a downward pressure, which ballasts the front end of the truck and counteracts side thrust. This is but one of the many features of the Frink. Write today for further information.



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<p>ALBRIGHT & FRIEL, Inc. <i>Consulting Engineers</i> WATER, SEWAGE & INDUSTRIAL WASTE PROBLEMS, AIRFIELDS, REFUSE INCINERATORS & POWER PLANTS INDUSTRIAL BUILDINGS CITY PLANNING REPORTS VALUATIONS LABORATORY 1520 Locust Street Philadelphia 2</p>	<p>CONSULTING ENGINEERS Your professional card belongs in this directory of leading engineer specialists, where it will be seen by those who employ consultants. For rates, write: PUBLIC WORKS, 310 East 45th St., New York 17, N. Y.</p>	<p>HOWARD R. GREEN CO. <i>Consulting Engineers</i> DESIGN AND SUPERVISION OF MUNICIPAL DEVELOPMENTS Water Works and Treatment—Sewers and Sewage Disposal—Investigations and Valuations 208-10 Bever Bldg., Cedar Rapids, Iowa Established 1913</p>
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<p>CLINTON L. BOGERT <i>Consulting Engineer</i> WATER SUPPLY AND TREATMENT SEWERAGE AND SEWAGE TREATMENT 624 Madison Avenue New York, 22, New York</p>	<p>J. W. GOODWIN ENGINEERING CO. <i>Municipal and Consulting Engineers</i> Design and Construction Supervision Air Ports, Waterworks, Sewerage, Sewage Treatment, Water Treatment, Gas Systems, Street Improvements, Reports, Appraisals Birmingham, Alabama</p>	<p>METCALF & EDDY <i>Engineers</i> Water, Sewage, Drainage, Refuse and Industrial Wastes Problems Airfields Valuations Laboratory Statler Building Boston 18</p>
<p>BUCK, SEIFERT AND JOST <i>Consulting Engineers</i> (FORMERLY NICHOLAS S. HILL ASSOCIATES) Water Supply Sewage Disposal Hydraulic Developments Reports Investigations, Valuations, Rates, Design, Construction, Operation Management, Chemical and Biological Laboratories 112 East 19th St. New York City</p>	<p>GREELEY AND HANSEN <i>Engineers</i> Samuel A. Greeley Paul Hansen Paul E. Langdon Kenneth V. Hill Thomas M. Niles Samuel M. Clarke Water Supply, Water Purification, Sewerage, Sewage Treatment, Flood Control, Drainage, Refuse Disposal 6 N. Michigan Ave. Chicago 2 299 Broadway New York 7</p>	<p>MALCOLM PIRNIE <i>Engineer</i> Water Supply, Treatment, Sewerage Reports, Plans, Estimates, Supervision and Operation, Valuation and Rates 25 W. 43d St. New York, N. Y.</p>
<p>JAMES M. CAIRD Assoc. Am. Soc. C. E. <i>Chemist and Bacteriologist</i> Water Analysts and Tests of Filter Plants Office and Laboratory Cannon Bldg., Broadway & 2nd St. Troy, N. Y.</p>	<p>MICHAEL BAKER, JR. <i>The Baker Engineers</i> CIVIL ENGINEERS—PLANNERS—SURVEYORS—MUNICIPAL ENGINEERS Airport Design • Sewage Disposal Systems • Water Works Design & Operation Consulting Services • Surveys and Maps HOME OFFICE—ROCHESTER, PA. San Antonio—Omaha—Philadelphia—Pittsburgh—Harrisburg—Atlanta—Anchorage, Alaska</p>	
<p>THE CHESTER ENGINEERS CAMPBELL, DAVIS & BANKSON Water Supply and Purification Sewerage and Sewage Treatment Power Developments and Applications Investigations and Reports Valuations and Rates 210 E. Park Way at Sandusky Pittsburgh 12, Pa.</p>	<p>S. F. FERGUSON <i>Water Leak Surveys Distribution Maps</i> 11 HILL STREET, NEWARK 2, N. J.</p>	
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<p>A. W. DOW, Inc. <i>Chemical Engineers</i> Consulting Paving Engineers Mem. Am. Instl. Ch. Engrs. Asphalt, Bitumens, Tars, Waterproofing. Paving, Engineering, Materials 301 Second Avenue New York</p>	<p>Enroll in a Refresher Course in MUNICIPAL PUBLIC WORKS ADMINISTRATION This course given by correspondence is designed to acquaint public works directors and city engineers with the organization and management of their departments. Personnel, planning, equipment, measurement, records, reports, and public relations are emphasized. INSTITUTE FOR TRAINING IN MUNICIPAL ADMINISTRATION 1313 EAST 60th STREET, CHICAGO, 37</p>	

CONSULTING ENGINEERS

(Continued from page 68)

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Municipal Buildings

Central State Bank Bldg.

Muscatoine, Ia.

Mr. Kurtz is particularly well suited for this work, having been a Sanitary Engineer for the City of Butler, Pa., as well as a Chemical Engineer in the Bureau of Sanitation at Bluefield, West Va. He is a member of the American Chemical Society.

Precision Methods Produce
New Air Compressors

Jaeger Machine Co.

400 Dublin Ave., Columbus, Ohio

Application of engine builders' precision methods to the manufacture of air compressors, begun during the war by The Jaeger Machine Company, will be continued in the production of a complete line of both portable and sta-



"Air Plus" New Jaeger Portable Air Compressor.

tionary models of 60 to 500 cu. ft. capacity.

By balancing the low and high compression cylinders in a "W" shaped bank and micro-honing and lapping in parts to close automotive tolerance, the resulting efficiency is said to permit full rated output of air with 20% to 30%

lower piston speed and the power plant operating well below its capacity at any altitude in the United States.

Advances in air cooling, also derived from war experience, have simplified control of the heat and condensation which result when air is compressed. Air-Animated "Tough Swedish Twin"

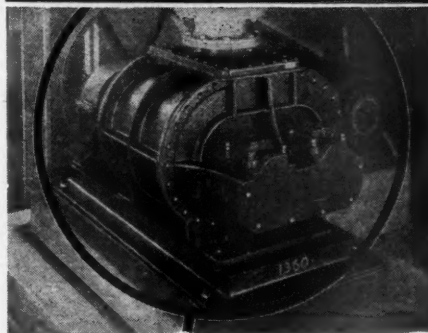
OUTSTANDING For . . .
SUSTAINED EFFICIENCY

Photo shows "R-C" exhaustor on pneumatic conveying system moving ashes from sludge incinerators. Capacity 1,700 c.f.m., at 478 r.p.m., producing 7 1/2" Hg. vacuum.

Wear has been practically eliminated in the impeller chamber of the Roots-Connorsville Positive Displacement Exhauster because there is no contact between the impellers and the casing. Thus the high volumetric efficiency of these "R-C" Units is practically constant during their extra long life.

Extensively used in water works and sewerage plants for

SLUDGE DEWATERING,
PRIMING CENTRIFUGAL PUMPS,
PNEUMATIC CONVEYING OF
LIME, INCINERATOR ASHES, ETC.

Write for Bulletin 23-B-12

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VACUUM PUMPS

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Made from wear-resisting
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valves of unusual size and high lift insure free air flow without back pressure. By this valve action, in combination with improved cylinder radiation and more efficient intercooling, air compressed to 100 lbs. per sq. inch is held to a temperature within 100° of the ambient atmosphere, eliminating both the danger of overheated tools and the pressure losses caused by sharp drops in temperature in long air lines.

Condensation and oil vapor are controlled by automatically unloading and draining the corrosive fluid from the intercooler system during each idling period.

Write the manufacturers for complete description of this new, precision built air compressor.

Foster D. Snell, Inc. Announces New Director of Analytical Department

*Foster D. Snell, Inc.
305 Washington Street
Brooklyn 1, New York*

Dr. D. Gardner Foulke, recently chief chemist for the Garfield Division of Houdaille-Hershey Corporation, has joined the staff of Foster D. Snell, Inc., as Director of the Analytical Department.

Dr. Foulke received his B. S. degree from Juniata College, the M. S. and Ph. D. degrees from Rutgers University. He served as Instructor in Analy-

tical Chemistry at Rutgers University and as Assistant Professor of Analytical and Organic Chemistry at Beaver College. Subsequently he entered the industrial field as analytical and research chemist with A. K. Graham Associates, leaving to become Assistant Chief Chemist in charge of the Analytical Laboratories of Republic Steel Corporation.

In his new position, Dr. Foulke will have complete charge of analytical work with the responsibility of developing necessary technics for new and unusual types of analyses.



Lowell E. Sennet

Sennet Succeeds Sybrandt As Ludlow Valve Chicago Representative

John L. Sybrandt, for many years manager of the Chicago office of the Ludlow Valve Manufacturing Co., Inc., has retired and his position is to be filled by Lowell E. Sennet, an engineer with long and thorough experience in valve applications. Mr. Sennet was graduated from Case School of Applied Science and had previously been with the Engineering Departments of the Grinnell and Crane Companies. This announcement was made jointly by A. W. Thompson, President, and Robert Bischoff, Sales Manager of Ludlow.

"CONVENTIONS"

May 2 . . . New England Sewage Works Assn. Spring Meeting, Hotel Statler, Boston, Mass.

The Annual meeting of New Jersey Sewage Works Assn. scheduled for March 22-23 has been cancelled in compliance with the War Mobilization Director's suggestion.

The 21st annual meeting of the Association of Highway Officials of North Atlantic States which was to be held at Hotel Pennsylvania, New York City, February 28-March 1-2 has been cancelled in compliance with the request of War Mobilization Director Byrnes.

In order that urgent questions requiring prompt attention by the directors and executive officers of the Highway Departments of several states, a directors' conference will be held in New York on March 1st and 2nd. Attendance will be limited to the directors and two official representatives of each member state. A. Lee Grover, Secy-Treas., State Highway Dept., Trenton, N. J.

PARA-PLASTIC is a hot poured material developed with the necessary qualities as a positive waterproof seal. This material is a rubbery, resilient and adhesive plastic when heated and poured into various joints and crevices.

PARA-PLASTIC differs greatly from the ordinary asphalt because it will not run or flow during hot weather—and will maintain a perfect bond without cracking in zero weather! Here is a product that will bond firmly with any form of construction, such as: concrete, wood, steel or any metal.

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Send for a catalog that illustrates the proper water seal for concrete and general construction.



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6051 West 65th Street. Chicago 38, Ill.

Manhole Covers and Inlets

429. Street, sewer and water castings in various styles, sizes and weights. Manhole covers, water meter covers, adjustable curb inlets, gutter crossing plates, valve and lamphole covers, ventilators, etc. Described in catalog issued by South Bend Foundry Co., Lafayette Boul. and Indiana Ave., South Bend 23, Ind.

Meters, Venturi

432. New bulletin illustrates Builders Air Relay system of transmission for the Venturi Meter which is particularly useful for liquids containing suspended solids like sewage. Eliminates corrosion, clogged pipes, etc. Write Builders-Providence, Inc., 9 Coddling St., Providence 1, R. I.

433. "The Selection of Main Line Meters," a highly informative and useful presentation prepared by a competent engineer, J. C. Thoresen, describes forms of differential producers and quickly solves typical problems with the use of graphic charts. Write Builders-Providence, Inc., 9 Coddling St., Providence 1, R. I.

Meters, Water

434. "Watchdog" water meters, made in standard capacities from 20 GPM up; frost-proof or split case in household sizes. All parts interchangeable with present models of same manufacturer. For bulletins, write Worthington-Gamon Meter Co., 282-296 South St., Newark, N. J.

Piling, Steel Sheet

435. Corrugated Steel Sheet piling of minimum weight, maximum strength, ease of handling is described and illustrated in a 14 page booklet. If you have a job involving piling write Caine Steel Co., 1820 N. Central Ave., Chicago, Ill., for this booklet.

Pipe, Cast Iron

436. Handbook of Universal Cast Iron Pipe and Fittings, pocket size. 104 pages, illustrated, including 14 pages of useful reference tables and data. Sent by The Central Foundry Co., 386 Fourth Ave., New York 16, New York.

437. Cast iron pipe and fittings for water, gas, sewer and industrial service. Split- deLavaud centrifugally- cast and pig-cast pipe. Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Burlington, N. J.

438. "Cast Iron Pipe and Fittings" is a well illustrated 44 page catalog giving full specifications for their complete line of Sand Spun Centrifugal Pipe, Fire Hydrants, Gate Valves, Special Castings, etc. Will be sent promptly by R. D. Wood Co., 400 Chestnut St., Philadelphia 5, Pa.

Pipe Forms

440. Making concrete pipe on the job to give employment at home is the subject of a booklet by Quinn Wire and Iron Works, 1621 Twelfth St., Boone, Ia., manufacturers of "Heavy Duty" Pipe Forms. Sent promptly on request.

Pipe Pusher

441. One-man-operated Hydraulic Pipe Pusher pushes pipe through ground under streets, sidewalks, lawns and other obstacles. Pays for itself in man hours saved on first few jobs. For complete facts and prices, ask for booklet S-117. Greenlee Tool Co., 2042 Columbia Ave., Rockford, Ill.

Pipe, Transite

442. Two new illustrated booklets, "Transite Pressure Pipe" and "Transite Sewer Pipe" deal with methods of cutting costs of installation and maintenance of pipe lines and summarize advantages resulting from use of Transite pipes. Sent promptly by Johns-Manville Corp., 22 East 40th St., New York 16, N. Y.

Pipe Joints, Sewer

444. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston, Adams, Mass.

445. Asphaltic Sewer Jointing materials are described and instructions for using them are included in a folder. Pre-moulded Sewer Pipe Belt, a modern method of jointing, a faster installation on the job, and Tufflex, a cold trowelling plastic for Sewer Pipe joints are the products. Write Servised Products Corp., 6051 W. 65 St., Chicago 38, Ill.

Pipe Joint Compounds

446. The uses of Tegul-Mineralad for bell and spigot pipe and G-K Sewer joint compound are described in a 16-page illustrated booklet issued by Atlas Mineral Products Co., Mertztown, Pa. Includes useful tables for estimating quantities needed.

Pumps, Sludge

447. Carter Sludge Pumps are described in 8-page illustrated bulletin, including specifications and tables. Address: Ralph B. Carter Co., Hackensack, N. J.

448. Non-clogging, vertical or horizontal, dry pit or submerged; storm water and drainage pumps are described in several Bulletins; also sump and bilge pumps. Dayton-Dowd Co., Quincy, Ill.

Pumps and Well Water Systems

449. Installation views and sectional scenes on Layne Vertical Centrifugal and Vertical Turbine Pumps fully illustrated and including useful engineering data section. Layne Shutter Screens for Gravel Wall Wells. Write for descriptive booklets. Advertising Dept., Layne & Bowler, Inc., Box 186, Hollywood Station, Memphis 8, Tenn.

451. Oil lubricated turbine pumps with open impellers. Five types of heads available. Specifications and illustrations in new bulletin 6930M-2 issued by Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago 5, Ill.

452. Centrifugal Pumps of various designs—single-stage, double-suction, split casing; single-stage single-suction; two-stage opposed impeller; three-stage; high-pressure; fire pumps; close-coupled. A bulletin for each type. Dayton-Dowd Co., Quincy, Ill.

Meter Setting and Testing

454. The most complete catalog we have seen on setting and testing equipment for water meters—exquisitely printed and illustrated 48-page booklet you should have a copy of. Ask Ford Meter Box Co., Wabash, Ind.

Sludge Drying and Incineration

458. "Disposal of Community Refuse by Incineration" is a handsome 34-page booklet that discusses incineration from a commonsense standpoint. Illustrated by numerous photos of typical installations and includes diagrammatic outlines of various plant designs. Write Morse Boulder Destructor Co., 207-P East 42nd St., New York 17, N. Y.

459. Recuperator tubes made from Silicon Carbide and "Fireclay" Coreburners for maximum efficiency are described and illustrated in bulletin No. 11 issued by Fitch Recuperator Co., Plainfield National Bank Bldg., Plainfield, N. J.

460. Nichols Herreshoff incinerator for complete disposal of sewage solids and industrial wastes—a new booklet illustrates and explains how this Nichols incinerator works. Pictures recent installations. Write Nichols Engineering and Research Corp., 60 Wall Tower, New York 5, N. Y.

Softening

462. This folder explains the process of Zeolite water softening and describes and illustrates the full line of equipment for that purpose made by the Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago 4, Ill. Includes flow charts, tables and other valuable data. Write for a copy of this instructive folder.

Sprinkling Filters

466. Design data on sprinkling filters of Separate Nozzle Field and Common Nozzle Field design as well as complete data on single and twin dosing tanks, and the various siphons used in them, for apportioning sewage to nozzles. Many time-saving charts and tables. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago 13, Ill.

Stand-by Motors

467. Buffalo stand-by motors for generators or pumping units are covered in illustrated specification sheets sent promptly by Buffalo Gasolene Motor Co., Dept. PW, Buffalo 3, N. Y.

Swimming Pools

468. Data and complete information on swimming pool filters and recirculation plants; also on water filters and filtration equipment. For data, prices, plans, etc., write Roberts Filter Mfg. Co., 640 Columbia Ave., Darby, Pa.

Taste and Odor Control

470. "Taste and Odor Control in Water Purification" is an excellent 92-page, illustrated booklet covering sources of taste and odor pollution in water supplies and outlining the various methods of treatment now in use. Every water works department should have a copy. Write Industrial Chemical Sales Div., 230 Park Ave., New York 17, N. Y.

471. Technical pub. No. 207 issued by Wallace & Tiernan Co., Inc., Newark 1, N. J., describes in detail taste and odor control of water with BREAK-POINT Chlorination, a method of discovering the point at which many causes of taste may be removed by chlorination with little or no increase in residual chlorine. Sent free to any operator requesting it.

Treatment

475. Three types of clarifiers for sewage treatment are illustrated and described in a new bulletin issued by Graver Tank & Mfg. Co., 332 South Michigan Ave., Chicago 4, Ill.

476. "Safe Sanitation for a Nation," an interesting booklet containing thumbnail descriptions of the different pieces of P.F.T. equipment for sewage treatment. Includes photos of various installations and complete list of literature available from this company. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago 13, Ill.

477. All-steel Rotary Distributors, correctly designed for the small and medium sized sewage plants, are the subject of a new, well illustrated booklet issued by Graver Tank & Mfg. Co., 332 South Michigan Ave., Chicago 4, Ill. This booklet also covers distributors for various types of high-rate trickling filters.

481. "Sedimentation with Dorr Clarifiers" is a complete 36-page illustrated catalog with useful design data. Ask The Dorr Company, 570 Lexington Ave., New York 22, N. Y.

483. A combination mechanical clarifier and mechanical digester. The Dorr Clarigester is explained and illustrated in a bulletin issued by The Dorr Company, 570 Lexington Ave., New York 22, N. Y.

484. Preflocculation without chemicals with the Dorrco Clariflocculator in a single structure is the subject of a new booklet issued by The Dorr Company, 570 Lexington Ave., New York 22, N. Y.

485. Dorrco Monorake for existing rectangular sedimentation tanks, open or closed, is described and illustrated in a new catalog sent on request. The Dorr Co., 570 Lexington Ave., New York 22, N. Y.

486. 28-page catalog describes and illustrates the Dorrco Hydro-Treator, a self-contained water treatment unit combining Flocculation, Sludge Thickening and Clarification. Reduces treatment time and lowers plant construction costs. The Dorr Co., 570 Lexington Ave., New York 22, N. Y.

488. "Packaged" Sewage Treatment Plants, specifically developed for small communities—100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 2433 Wolfram St., Chicago 18, Ill.

489. "Carter Controlled Flocculation" is title of illustrated folder available on request from Ralph B. Carter Co., Hackensack, N. J.

490. New bulletin fully describes and illustrates Hardinge sludge collectors for clarifiers, sludge concentration and skimming in both circular and rectangular tanks. Write Hardinge Company, Inc., York, Pa.

Underdrains, Trickling Filter

492. Illustrated bulletin describes the Natco Unifilter block of glazed, hard burned clay for underdraining filter beds. Write National Fireproofing Corp., Pittsburgh 12, Pa., for free copy.

Valves (See Gates, Air Release, etc.)**Water Treatment**

495. If you have a water conditioning problem of any kind, write Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago 4, Ill., who manufacture all types of conditioning equipment and will be pleased to make recommendations.

496. "Use of copper sulphate in water treatment plants" titles informative booklet, with valuable data on chemicals, dosage, etc. Write Tennessee Corporation, Atlanta 1, Ga.

497. Ferri-floc Ferric Sulphate—a new, valuable booklet on coagulation for water and sewage treatment plants. Write Tennessee Corporation, Atlanta 1, Ga.

Water Service Devices

500. Data on anti-freeze outdoor drinking fountains, hydrants, street washers, etc., will be sent promptly on request to Murdock Mfg. & Supply Co., 426 Plum St., Cincinnati 2, Ohio.

THEY'RE ANTI-FREEZING

There's no need of discontinuing the daily use of any MURDOCK Outdoor Water Service Device no matter how cold it gets or how long the cold weather hangs on.

They're ANTI-FREEZING!

It is another reason why "It Pays to Install MURDOCK."

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**TYPE X
SINGLE LID
Meter Box
COVERS**



These modern covers for water meter settings have the Lifter Worm Lock plus a hinge-effect feature which permits the lid to be leaned back for meter reading, or lifted off if desired. Made in several sizes and depths.

Write for catalog now.

FORD

Meter Box Co.
WABASH, INDIANA



E. D. Kingsley

E. D. Kingsley Dies

Edward Dickinson Kingsley, well known as a chemical industrialist, died of natural causes at his New York residence, Mayfair House, Park Avenue & 65th Street, on January 1st, at the age of 84.

Early in 1907 he organized the Electro Bleaching Gas Company for the purpose of manufacturing and distributing Liquid Chlorine, a compressed gas which was a new product at the time in this country and a chemical contribution of wide importance during World War I and during the succeeding years.

This modest start in the chemical field was the forerunner of his acquiring in 1915 the Niagara Alkali Company of Niagara Falls, New York, which produced a line of heavy chemicals, and later, Pacific Lime Company, Ltd. of Canada, Kingsley Navigation Company, Ltd. of Canada, and the Kingsley Navigation Company of California. These companies he headed as President until 1941 when he became Chairman of the Board of Directors of Niagara Alkali Company.

A Success Story

In a beautifully printed and illustrated brochure entitled "Pioneers For 50 Years," The Cleveland Pneumatic Tool Co. tells how an eighteen year old immigrant boy coming to this land of opportunity, by initiative, courage and hard work, laid the foundation for one of Cleveland's great and successful manufacturing enterprises.

Claus Greve, a native of Denmark, immigrated to America in 1872. In 1894 after 22 years of hard work, earning and learning, he helped to organize the company now known as Cleveland Pneumatic Tool Co. of which he was president until 1931 when he became chairman of the board. He was succeeded by Louis W. Greve, his son, who was president until his death on February 2nd, 1942. George Paul Torrence was elected to fill the vacancy.

During the 50 years of its life Cleveland Pneumatic Tool Co. grew steadily and formed as affiliates The Cleveland Rock Drill Co., Cleveland Pneumatic Aeroil Co. and Cleveland Pneumatic Tool Co. of Canada.

The little original Cleveland Pneumatic group of ten men has grown to thousands—an organization spread over many acres of modern, well-equipped buildings, manufacturing a wide variety of equipment vital to many industries.

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